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SYMPOSIUM ON NONVERBAL COMMUNICATION

Foreword
—Joel R. Davitz and Lois J. Davitz, coeditors 51
An Approach to the Problem of Symbolic Representation: Nonverbal and Verbal
—Bernard Kaplan 52
Vocal Communication of Personality and Human Feelings
—John A. Starkweather 63
Judgment of Emotion in Word-free Voice Samples
—William F. Soskin and Paul E. Kauffman . . 73
Nonverbal Vocal Communication of Feeling
—Joel R. Davitz and Lois Jean Davitz . . . 81

OTHER ARTICLES AND DEPARTMENTS

Guest Editorial: Communication Is Everybody's Business
—Thorrel B. Fest and Ralph G. Nichols . . . . . Inside Front Cover
Speech Intelligibility: A Summary of Recent Research
—John W. Black 87
The Predictability of Words in Context and the Length of Pauses in Speech
—Frieda Goldman-Eisler 95
The Manual of Standard Operating Procedures
—Don Palmer 100
Research Notes
—Francis A. Cartier 103
Book Reviews
—Martin P. Andersen 105

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Guest Editorial:

COMMUNICATION IS EVERYBODY'S BUSINESS

Communication, free and productive communication, must be everybody's business if our society is to remain free and productive. Professional leadership in this area is the responsibility of the National Society for the Study of Communication and the Speech Association of America. The many bonds which draw these two organizations together are strengthened by such contemporary developments as population growth, space control, and the "cold war."

Both associations derive from the same personal, professional, and societal needs. Similar problems arise for both because of public ignorance and misconceptions concerning both the process of human communication and the nature of the professional groups. Between NSSC and SAA differences appear to be those of degree rather than of basic direction. SAA has been primarily concerned with "speech," and until recently its orientation has been almost exclusively academic. NSSC, in spite of a somewhat broader purpose, the study of the total process of human communication, has been heavily (probably too heavily) academic. But together these two organizations can, if they choose, provide the will, the insight, and the capacity for professional leadership in this area of human interaction.

As professional organizations and as individuals we must now consider the communication implications of such developments as these:

1. The increasing size and complexity of our social organization.

2. The accompanying loss of individual identity and perspective in a highly organized world.

(Continued on page 112.)

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THE JOURNAL OF COMMUNICATION

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THE SYMPOSIUM ON NONVERBAL COMMUNICATION: FOREWORD*

JOEL R. DAVITZ AND LOIS J. DAVITZ, *Coeditors***

Theory and research concerned with nonverbal communication includes an extraordinary range of problems and a wide variety of scientific disciplines. In planning this symposium, we were caught, therefore, on the horns of a dilemma. Whereas reviewing a broad range of problems would sacrifice in depth what was gained in breadth of coverage, focusing on a relatively limited area would lack comprehensiveness but would provide a detailed examination of a circumscribed set of problems from selected viewpoints. Choosing the latter course, though recognizing that much research in the general area would necessarily be omitted, we selected papers oriented primarily in terms of psychological investigations of vocal and graphic communication. Even within this limited area, however, significantly different theoretical approaches and research techniques are represented.

Bernard Kaplan briefly reports the point of view developed more fully by Dr. Heinz Werner and himself in their forthcoming book, *The Symbolic Process: A Developmental Analysis.* John Starkweather, who comprehensively reviews a large body of research previously reported in many different sources, provides a clear, succinct organization of numerous findings heretofore unrelated in the literature of communication research. William Soskin and Paul Kauffman describe an important addition to the limited store of research techniques available in this area, and thus they provide a rigorous basis for studying the nonverbal aspects of communication in everyday speech. And finally our own paper, by summarizing the research which we and our colleagues have done during the past few years, illustrates how one project in this area began and how the initial steps were taken in a series of investigations.

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* The editor of *The Journal* is indeed grateful to Dr. Joel R. Davitz and to Dr. Lois J. Davitz for their services in planning the symposium, securing the articles, corresponding with the authors, and doing the initial editing.

** Joel R. Davitz is an associate professor in the Department of Psychological Foundations and Services, Teachers College, Columbia University, and Lois Jean Davitz is a faculty member at Patterson State College.

AN APPROACH TO THE PROBLEM OF SYMBOLIC REPRESENTATION: NONVERBAL AND VERBAL

BERNARD KAPLAN*

During the past fifty years it has become increasingly recognized that symbolic activity is among the most characteristic features of human existence and that the whole development of human culture is based upon man's capacity for transforming simple sensory material into symbolic vehicles—carriers of the finest intellectual and emotional distinctions. So important is symbolic activity in human life that one of the outstanding contemporary philosophers has urged: "Instead of defining man as an *animal rationale*, we should define him as an *animal symbolicum*. By so doing we can designate his specific difference. . . ."[1]

Despite this general recognition of the centrality of symbolic activity to the very definition of man, relatively little work has been undertaken by academic psychologists to clarify the nature of this activity. Even where work has ostensibly been undertaken on the problem of symbolization, it has often been done by those who are theoretically disposed to play down any uniqueness in man's capacities and who are hence inclined to treat symbolization in man on the model of sign-behavior in animals.[2]

PURPOSE

In this paper I shall be primarily concerned with the presentation of a standpoint for inquiring into symbolic activity and into the relations of this activity to other functions—e.g., perceiving, and forming concepts. A central feature of this approach is the employment of various nonverbal media in the study of rep-

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* Professor Kaplan is a member of the Department of Psychology and the Institute of Human Development, Clark University. This paper was written during the time that he was the Principal Investigator on a project dealing with "The Nature of Symbolization and Its Role in Cognition." The project is supported by Grant No. M-3853 from the National Institute of Mental Health.

[1] Ernst Cassirer, *An Essay on Man* (New York: Doubleday-Anchor, 1944).

[2] See *Ibid.*; Susanne Langer, *Philosophy in a New Key* (Cambridge, Mass.: Harvard University Press, 1942); and Ernest Hilgard, "Psychology after Darwin," in Sol Tax (ed.), *Evolution after Darwin*, Vol. II (Chicago: University of Chicago Press, 1960).

resentation. In the course of this exposition, I shall indicate briefly how such media have been and are being used in inquiries carried out from the standpoint which Heinz Werner and I use. This reference will be solely for the purpose of exemplifying some features of the orientation. Systematic and detailed treatment of the studies themselves is reserved for another time and place.[3]

An Antithetical Approach

Perhaps a useful way to establish the orientation which I propose is to contrast it with another—and antithetical—approach towards some of the major theoretical issues in the area of symbolization. The issues involved are at the very heart of the "problem of knowing"; they concern the interwined relationships of "knower and known," "thought and things," "symbol and referent," etc. With regard to this opposing approach, I do not suggest that it has any single contemporary exponent; it may or may not. I do believe, however, that in essence it underlies many contemporary treatments of symbolization and cognition and that it determines the formulation of problems, the design of experiments, the admission of evidence, etc.[4] Whether or not my belief is justified, I present the approach here primarily as a device for placing in relief the standpoint which I espouse.

Viewed from this other orientation, the objects of our experience exist in an interpersonal and external space in exactly the same form and relationships which they have for us when we perceive them. The knowing of objects is conceived as a more or less direct translocation of something "outside the mind" to a place "inside the mind" without this movement in any way affecting the nature of these objects. In other words, through a process which remains essentially the same during the entire course of ontogenesis, the individual gradually comes to per-

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[3] Heinz Werner and Bernard Kaplan, *The Symbolic Process: A Developmental Analysis* (in preparation).

[4] In this connection, see the following: Grace A. de Laguna, "Appearance and Orientation," *Journal of Philosophy*, XXXI (1934), 72–77; Thelma Lavine, "Knowledge as Interpretation: An Historical Survey," *Philosophy and Phenomenological Research*, X (1950), 526–540, and XI (1950), 88–103; Stephen C. Pepper, *World Hypotheses* (Berkeley: University of California Press, 1942).

ceive things as they are. Typically tied up with this view of object-perception is a thesis concerning the nature of concept-formation: Concepts or general ideas, it is maintained, are formed through a process of abstraction by means of which the knower selects out of a multiplicity of perceived objects (or their imaged facsimiles) those features which are objectively common to all. The common or identical elements constitute the conception.

In the process of perceiving objects or forming conceptions, symbols are perhaps useful, but not, according to this view, really necessary; after the object is seen or the conception formed, vocal or nonvocal elements may be used to indicate the object or fix the concept "in the mind" (label or tag it, so to speak) but such signs or marks have no role in determining the characteristics of the objects perceived or the notions conceived.[5]

From this opposing standpoint, the relationship between the symbol (sign, conditioned stimulus) and its referent (perceptual object, conceived idea)is perhaps most succinctly expressed in *the principle of arbitrariness.* According to this principle, a material entity becomes a sign or symbol for something else by virtue of a purely external tie between the entity and its referent. This external tie is one of repeated contiguity and/or arbitrary stipulation: the sign is paired with the perceptual object or conception, assigned to it as its "name," and henceforth used in communication to indicate the object or to evoke the concept.[6]

In the main, the standpoint we have just outlined is agenetic: it assumes that the same processes are operative throughout the phylogenetic scale and that no essential difference exists between responding to material elements as signals and taking them as symbols. It therefore maintains that one can, without distortion

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[5] For a critique of this general orientation and its variants, see the following: Ernst Cassirer, *Das Erkenntnisproblem in der Philosophie und Wissenschaft der neueren Zeit,* Vol. I (Berlin: B. Cassirer, 1906), ch. 1; Ernst Cassirer, *Substance and Function* (Chicago: Open Court, 1923), ch. 1; Ernst Cassirer, *Language and Myth* (New York: Dover, 1946), chs. 3, 4 and 6; Ernst Cassirer, *Philosophy of Symbolic Forms,* Vol. I (New Haven, Conn: Yale University Press, 1953).

[6] For a critique of this principle by a linguist-psychoanalyst, see Edouard Pichon, "La linguistique en France: problèmes et méthodes," *Journal de Psychologie,* XXXIV (1937), 25–48.

or oversimplification, study symbolic behavior in rats and parrots as well as in man.[7]

The Role of Symbolic Activity in Forming Concepts

In contrast to this standpoint stands the orientation which this writer endorses. *First, objects of human perception are permeated through and through with our human activities as knowers and doers.* No direct, unmediated contact with things-in-themselves exists which can in any way be the subject matter of cognition. In other words, perceived objects *as known* are made and not discovered—they are productions or constructions in which the knower's activity plays a constitutive role. From this vantage point, the "given" is indeterminate as to its characteristics and even as to its nature; the specific determination given to presented phenomena varies with different individuals, for the same individual at different times, etc. Furthermore, this determination rests in large part on an underlying activity of schematization, which is indissolubly linked with symbolic activity.[8]

Second, conceptions are rarely formed through the abstraction of objectively identical elements from a manifold of particular percepts. In fact, in a very important sense, conceptions are presupposed in any particular situation where a given sensory event is perceived in one way rather than in another: In Kant's famous aphorism, "Percepts without concepts are blind." Furthermore, conceptions, in order to be grasped, must either be immanent in some particular event or else be represented by some

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[7] For a critique of this type of "reductionism," see Hilgard, *loc. cit.*; and T. C. Schneirla, "Levels in the Psychological Capacities of Animals," in Roy W. Sellars, et al. (eds.), *Philosophy for the Future* (New York: The Macmillan Company, 1949).

[8] See Revault d'Allones, "La schématisation," in Georges Dumas (ed.), *Nouveau Traité de Psychologie*, Vol. IV (Paris: Alcan, 1934).

An example of the interpenetration of symbolization and perception is given by A. F. Chamberlain in his report of the following statement by an educated Mohawk Indian: "When I listen [to the whip-poor-will] with my Indian ears, it seems to me utterly impossible to form any other word for the imitation of its notes than *kwa-kor-yeuh*, but when I put on my English ears I hear the bird quite distinctly saying *whip-poor-will.*"—"Some Points in Linguistic Psychology," *American Journal of Psychology*, V (1892), 116. In this connection, see also Maurice Grammont, "La psychologie et la phonétique: la phonétique impressive," *Journal de Psychologie*, XXVII (1930), 544–613.

tangible form intended as a symbol.[9] Conceptions are therefore always tied up or interdependent with some symbolic process, although this type of symbolization need not be verbal or in any way overt. Again we contend that probably under all circumstances, but at least in certain phases of cognitive activity, the symbolic process enters into the articulation of conceptions and thus determines the meaning that ideas have for us in our lives.[10]

The Relationship of Symbolic Vehicles and Referents

As to our view concerning the relationship between symbolic vehicles and referents, Dr. Werner and I distinctly reject both the principle of arbitrariness and the notion that contiguity and convention are the fundamental factors in linking patterns (whether vocal or nonvocal) to referents. At best a partial explanation, this view is limited in that it considers the problem of symbol-referent relationships primarily from the perspective of a detached observer. It therefore concentrates on the obvious fact, externally speaking, that no intrinsic relationship exists between a material entity and the phenomenon which this entity comes to represent in cognition. The external perspective either fails to consider or studiously ignores the role of the subject or symbolizer who utilizes material patterns to represent referents: it thus fails to take into account the most essential factor in symbol-situations—viz., the human being who intends a material

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[9] For the role of intentionality in symbolic activity, see Charles Serrus, "L'intention de signification," *Journal de Psychologie*, XXXIII (1936), 321–358; also Roderick Chisholm, "Intentionality and the Theory of Signs," *Philosophical Studies*, III (1952), 56–63.

[10] Our standpoint here is closely related to—in some sense, indeed, an extension of—the thesis, initially expressed by von Humboldt and recently taken up by such philosophers as these: Wilbur Urban, *Language and Reality* (New York: The Macmillan Company, 1939); Langer, *loc. cit.*; Cassirer, *Language and Myth* and *Philosophy of Symbolic Forms*, Vol. I. The Humboldtian thesis has also been taken up by such linguists as the following: Edward Sapir in David Mandelbaum (ed.), *Selected Writings of Edward Sapir* (Berkeley: University of California Press, 1949); and Benjamin Lee Whorf, *Four Articles on Metalinguistics* (Washington, D.C.: Foreign Service Institute, 1950). We believe that this thesis becomes warranted only when language is conceived in the original Humboldtian sense as *energeia* (activity) rather than *ergon* (product); in this sense, language activity is not restricted to vocal patterns.

entity as a symbol for the representation of an object or the articulation of a conception.[11]

In contradistinction to the opposing viewpoint, our approach is definitely developmental.[12] We maintain that there is a sequence of stages in the relationship between symbolic activity and cognition. In certain respects there is continuity between the earlier and the later phases; in other regards there is discontinuity. Thus, although later stages cannot be reduced to earlier ones, the earlier phases do not drop out when later modes of symbolic activity come into play; rather the genetically earlier phases are subordinated to the more advanced forms and integrated within them. Under conditions where the higher modes of symbolization are impaired or where the normal adult is directed towards some specialized activity, these earlier phases of the symbol-cognition relationship become manifest once again.

It is our belief—especially with respect to the developmentally earlier phases of symbolic activity—that when material entities (e.g., vocalized sound patterns, bodily movements, visual patterns, etc.) or particular objects or events of everyday life are used as symbols for the representation of phenomena of a totally different order, these entities or events are viewed in a markedly different way than that in which they are ordinarily regarded in our daily pragmatic-technical commerce with them.[13] By our

[11] We would therefore say that studies focussing on whether sound patterns of a foreign language may be matched beyond chance expectancies with names for objects or events in our language have been concerned with a secondary and derivative issue. The main issue is not whether there is consensus, but how a subject goes about making a matching—i.e., how he construes the sound pattern and the referent to make any meaningful choice whatsoever. See E. Gombrich, *Art and Illusion* (New York: Pantheon, 1960).

[12] The term *developmental* is used in the sense given it by Heinz Werner, *Comparative Psychology of Mental Development*, 3rd ed. (New York: International Universities Press, 1957) and by H. Werner, "The Concept of Development from a Comparative and Organismic Point of View," in D. B. Harris (ed.), *The Concept of Development* (Minneapolis: University of Minnesota Press, 1957). See also S. Pepper, *op. cit.*, ch. 11; and W. Werkmeister, "Cassirer's Advance Beyond Neo-Kantianism," in Paul Schilpp (ed.), *The Philosophy of Ernst Cassirer* (Evanston: Library of Living Philosophers, 1949).

[13] "No representation, however faithful and photographically exact, ever literally reproduces what it represents. The identity between the structural pattern of the representation and the pattern of what is represented, which is essential to representation, is exhibited only when the representation is regarded from the proper standpoint, and this is, of course, not itself contained in the representation."—de Laguna, *op. cit.*, p. 75.

symbolizing activity, we imaginatively transform these entities and particular events so that they become expressive of that which they are taken to represent.[14] This transformation does not change the material entity *qua* material entity; for the external observer nothing has happened to the material entity which was previously part of the world of existents but which has now become part of the world of symbols; for the symbolizer, however, the material entity has, in certain respects, been brought into the same universe as that of the phenomenon it is taken to represent—a universe analogous to that comprising the object-and-event experiences of early childhood—i.e., a physiognomic dynamic universe.[15]

> It is important to stress the difference between early perception and later symbolic representation. In contrast with primitive perception, where no duality exists, symbolization obtains only where there is a duality or tension between symbol and referent. Where such a duality is not maintained, symbol (word) realism is manifested; i.e., the material entity is regarded as consubstantial with the referent and the distinction between the two collapses. The material entity is then treated in the same way as the referent.[16]

In the universe instituted through symbolic activity, the previously "meaningless" patterns—e.g., sounds, lines, movements, or the simple events of everyday life—take on a new coloring and significance: they are invested, so to speak, with a life of their own,[17] which they express in their shapes, contours, and "actions."[18] These features of the patterns *qua* symbols are, to be sure, quite fluid, malleable within limits, etc., but the range of meanings for which they are taken to be adequate is not infinite. In any cognitive activity, these expressive features of

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[14] Cf. Benedetto Croce, *Aesthetic*, rev. ed., (New York: Noonday, 1956).

[15] Cf. Heinz Werner, "A Psychological Analysis of Expressive Language," in H. Werner (ed.), *On Expressive Language* (Worcester, Mass.: Clark University Press, 1955); Heinz Werner, *Comparative Psychology of Mental Development;* and Bernard Kaplan, "Some Psychological Methods for the Investigation of Expressive Language," in Heinz Werner (ed.), *On Expressive Language.*

[16] Cf. C. K. Ogden and I. A. Richards, *The Meaning of Meaning* (New York: Harcourt, Brace and Company, Inc., 1923), ch. 2; J. G. Frazer, *The Golden Bough* (ed. T. Gaster) (New York: Criterion, 1959); also Sandor Ferenczi, *Sex and Psychoanalysis* (New York: Basic Books, 1950), ch. 4.

[17] Cf. Cassirer, *Language and Myth*, ch. 6.

[18] Cassirer discusses this Thou-like character which material entities take on with respect to the problem of the origin of language.

the pattern-becoming-vehicle affect the referents with which they are being linked and are affected by them. The symbolizer attempts to bring vehicle and referent into some sort of "fitting" relationship by restructuring the former, by reformulating the latter, or by both; finally, some *modus vivendi* is established.[19]

Advantages of Nonverbal Media for Studies of Symbolic Activity

As I have already mentioned, Werner and I in our research have used nonverbal media extensively. Our employment of these media (e.g., line patterns, bodily movements, colors, visual imagery, hypnotically induced dreams, and clay) is based primarily on three considerations. First, our lifelong, habitual, and intimate use of the vocal-sound medium in the development of speech symbols may tend to obscure our vision of the handling of that medium in symbolic activity. This problem is especially likely to exist in the case of sound patterns which have already been structured into symbols—i.e., have become invested with significance. In contrast, the use of nonvocal media, which have not been previously exploited in the service of representation, provides a distance which permits a better view of how the intention to symbolize operates to transform material entities into symbolic vehicles. *One may plausibly argue that certain findings pertaining to the ways in which line patterns or clay blobs are handled in the process of symbolization are, in principle, generalizable to the ways in which sound patterns are handled in the process of being transformed into speech symbols.*[20] After all, vocally produced sound patterns are, from a pragmatic-

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[19] See Heinz Werner and Bernard Kaplan, "Symbolic Mediation and Organization of Thought: An Experimental Approach by Means of the Line-Schematization Technique," *Journal of Psychology*, XLIII (1957), 3–25; also Margery Bodansky, "An Experimental and Theoretical Inquiry into the Symbol-Meaning Relationship," M.A. Thesis, Clark University, 1956.

The material pattern through which an individual seeks to realize his unformed conceptions has its say; the resultant product of the confluence and the struggle of unformed meanings with the potential vehicle of representation is often unexpected not merely by the onlooker but also by the producer. The product, in the words of Shakespeare, often is one "not answering the aim/ And that unbodied figure of the thought/ That gave it surmised shape."

[20] Cf. Gombrich, *loc. cit.*

technical standpoint, no more (and no less) like the events they come to represent than are linear and clay forms.[21]

A second reason for our use of media other than vocal-sound is related to our general thesis that symbolic vehicles play a determining and intrinsic role in cognitive functioning. *A priori*, it is likely that different material media—despite certain generic similarities—are not equally exploitable for the representation or the expression of the innumerable kinds of experiences we undergo: one does not easily express in words what one can express in music and vice versa. Because of these possible differences in the quality and the range of expressivity of different media, it seems to us important to compare and to contrast symbolization of a given kind of experience in various media; doing so allows us to get both a general picture of symbolic activity and a specific understanding of the advantages and the limitations of particular media.

The third reason for using nonverbal media is that they have generally not been structurized into a system of symbols. Individuals obliged to use them for symbolization must begin—as it were—without the advantages and the constraints of an already formed and organized system of vehicles. Through the use of nonverbal means we are enabled to witness, to a far greater extent than would be true otherwise, the early stages in the formation of symbolic vehicles out of a material medium. These observations, by permitting us to make certain inferences as to the early stages in the systematic structuring of any medium, provide some grounds for reconstructing the way in which articulated sounds are formed into speech symbols and systems of such symbols.[22]

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[21] The fundamental similarity of processes underlying the formation of speech symbols and the formation of significant forms in other media has been most extensively elaborated by Croce, *loc. cit.* See also Edward Sapir, *Language* (New York: Harcourt, Brace and Company, 1921), preface.

[22] Since we assume that sounds become symbols only by virtue of the symbolizing activity of a human agent, it is possible that sounds—even with the external forms of words—may be used nonsymbolically. The material pattern itself will not tell us whether a sound pattern is being used symbolically or nonsymbolically. This observation, however, does not negate the fact that some sounds in our everyday discourse are used symbolically. Cf. J. R. Kantor, "Language as Behavior and as Symbolism," *Journal of Philosophy*, XIV (1929), 150–159.

Illustrations of the Use of Nonverbal Media in Studying Symbolization

Werner and I have employed nonverbal media as a means of gaining insight into a variety of fundamental problems. Here I shall sketch only a few of the studies we have undertaken.

In one study, concerned with the handling of vehicles in the process of representation, we asked subjects to create linear patterns which they felt were adequate for the representation of certain conceptions. For example, we requested them to form a line pattern to represent "an outburst of rage." After a subject had spontaneously produced a linear pattern to represent such a given conception, we asked him to view the pattern he had formed and to note down other conceptions which this pattern might serve to portray. Thus, the symbol produced for the given conception and the extension of this symbol to stand for other conceptions were completely in the hands of the individual subject. After this phase of the experiment was completed, the subject was told to express verbally how the same material pattern—the linear vehicle initially formed—had been used to represent the various conceptions he had listed. In general, we have found that the same material pattern was *imaginatively* restructured—perhaps modified, sometimes elaborated, and occasionally radically changed—in order to portray the different conceptions. In other words, although the pattern was, from the point of view of an external observer, invariant, for the symbolizer it was imaginatively changed so that in each case it sustained for the subject an analogical relationship to the content symbolized.[23] There is no need to emphasize the bearing of such a study on the problem of how an invariant vocal form may be used to represent diverse conceptions at different times.

In another study we investigated the problem of so-called arbitrary stipulation. Here, presenting subjects with certain line patterns, we stipulated that a given design was to be taken as

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[23] The establishment, not the discovery, of an analogical relationship between the vehicle and the referent is characteristic of symbolization in normal adults. A person typically struggles, with varying degrees of success and satisfaction, to form an analogy between the vehicle and the referent; he does not simply *observe* a similarity. Cf. K. Aschenbrenner, "Intention and Understanding," in G. P. Adams et al. (eds.), *Meaning and Interpretation* (Berkeley: University of California Press, 1950).

the representation first of one state of affairs and then of another which was contrary or antithetical. For example, we successively decreed that a given line pattern was to be taken as the symbol for "modesty" and as the representation for "arrogance." Again, inquiry showed that the symbolizer did not simply associate the given pattern with the stipulated conception, but rather that he imaginatively transformed the linear pattern so that it fit now one and now the other of the two conceptions. In other words, although an arbitrary relationship between symbol and symbolized was presented, the subject strove to establish a "natural" relationship, analogically based, between the two moments.

The final illustration pertains to the use of nonverbal media for the investigation of primitive forms of cognition. In one of the studies concerned with this problem, we gave subjects the task of representing certain logical relationships in a medium of visual imagery.[24] For example, the subjects were asked to represent such situations as "He paces a great deal if he works hard," "He cries if he is hurt," etc. Typically, it is difficult, if not impossible, to express a conditional relationship in the medium of visual imagery. Insofar as a person does express such relationships, he does so with expressions which are indissolubly fused with the representations of the concrete, tangible features of the given situations.

Through the employment of such media as expressive lines, visual imagery, hypnotically induced dreams, bodily gestures, etc., Werner and I have been able, we believe, to arrive at a clearer picture of the genetically earlier phases in the symbolic organization of experience.[25] It is our hope that the coordination of findings from experimental studies on nonverbal representation with those from naturalistic studies on the ontogenesis of speech will eventually permit the formulation of the general developmental relationships between the symbolic process and the other activities of human beings.

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[24] Cf. I. Meyerson, "Les images," *Journal de Psychologie*, XXVI (1929), 625–709.

[25] Cf. Heinz Werner and Bernard Kaplan, "The Developmental Approach to Cognition: Its Relevance to the Psychological Interpretation of Anthropological and Ethnolinguistic Data," *American Anthropologist*, LVIII (1956), 866–880; also Werner and Kaplan, "Symbolic Mediation and Organization of Thought."

VOCAL COMMUNICATION OF PERSONALITY AND HUMAN FEELINGS

JOHN A. STARKWEATHER*

Neither novel nor controversial is the viewpoint that an interpersonal exchange communicates more than a stenographic transcription of the same conversation. The tone of voice and the manner of speaking affect the listener's perception of the speaker's feeling-state. These vocal guideposts suggest some of the personality characteristics of individuals, often enable a person to recognize a friend without seeing him, and indicate the speaker's emotional condition of the moment. During infancy, prior to the learning of language, parents and children communicate largely through nonverbal vocal cues.

Most of the time an adult listener does not consciously attend to vocal expression as a communicative stimulus separate and distinct from the speaker's words. Nonverbal signals, nevertheless, are influential; and if at variance with the ideas presented through language, they are usually believed. A parent, for example, believes the sounds and not the words when his child insists in a very tired and petulant voice that he *is not* tired.

In respect to discrepancies between the vocal and the verbal messages, listeners appear to differ in their sensitivity. Attempts to indicate irony or sarcasm are lost upon insensitive persons, whereas others seem to possess a high degree of interpretive skill. Some psychotherapists place great emphasis on responsiveness to nonverbal cues.

PURPOSE AND LIMITATIONS

Communication by nonverbal means does appear to exist. The purpose of this paper is to synthesize relevant research findings bearing upon such questions as these: (1) To what extent does nonverbal communication occur? (2) What types of information are transmitted nonverbally? (3) Are some persons more skillful than others in sending or receiving information by this means?

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(4) Under what conditions does nonverbal communication take place? (5) What progress is being made in utilizing objective measures to increase the accuracy of communication through nonverbal means?

Space requirements necessitate two limitations in addition to a severe condensation in reporting experiments. First, this paper considers only one type of nonverbal communication—vocal cues. Second, it is confined to experiments pertaining to judgments of personality and sensitiveness to human feelings.

Judgments of Personality Characteristics from the Voice

Experiments pertaining to personality judgments based upon speech have occurred sporadically since the early 1930's. The earliest of these found listeners accurate in judging the sex of the speaker, moderately good at estimating age, and somewhat successful in inferring occupation, height, weight, and appearance.[1] Other studies also reported moderate success in making correct statements about a speaker's appearance.[2]

Fourteen experiments by Cantril and Allport also showed that nonverbal cues communicate some types of information beyond chance expectancy. Working with twenty-four speakers and six hundred judges, they found that listeners had some success in matching voices with age, "appearance in person," vocation, extroversion-introversion, ascendance-submission, values, and "summary sketch of personality." Nonverbal cues, however, were unreliable in communicating height, complexion, "photographic appearance," handwriting, political preferences, or dominant values. No characteristic was always revealed correctly, and judges agreed better with each other than with the criterion. An hypothesis that blind judges have special skill in interpreting the voice as a nonverbal means of communication was rejected.[3]

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[1] T. H. Pear, *Voice and Personality* (New York: John Wiley & Sons, Inc., 1931). Also: H. Herzog, "Stimme und Persönlichkeit," *Zeitschrift Psychologie*, CXXX (1933), 300–379.

[2] H. C. Taylor, "Social Agreement on Personality Traits as Judged from Speech," *Journal of Social Psychology*, V (1934), 244–248.

M. Bonaventura, "Ausdruck der Persönlichkeit in der Sprechstimme und im Photogramm," *Archives gesamte Psychologie*, XCIV (1935), 501–570.

R. Stagner, "Judgments of Voice and Personality," *Journal of Educational Psychology*, XXVII (1936), 272–277.

[3] Hadley Cantril and Gordon Allport, *The Psychology of Radio* (New York: Harper & Brothers, 1935).

Still other experiments supporting the general conclusion that vocal cues are a means of communication in some instances but not in others were those conducted by P. J. Fay and W. C. Middleton. Working with voices transmitted over a public address system, these research workers found that listeners had some success in judging Spranger Personality Types,[4] occupation,[5] intelligence,[6] and body type,[7] but that they were not successful in discerning fatigue,[8] sociability,[9] lying,[10] introversion,[11] or leadership.[12]

Despite the frequent reports of success in identifying personality traits from vocal cues, the numerous failures in these and other studies leave the writer pessimistic concerning the utility of assessing such traits from nonverbal stimuli. Two earlier writers who reviewed the experimental literature in this area pointed out the influence of stereotypes. Findings, in general, indicate that judges agree better with one another than with external criteria.[13]

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[4] "Judgment of Spranger Personality Types from the Voice as Transmitted over a Public Address System," *Character and Personality*, VIII (1939), 144–155.

[5] "Judgment of Occupation from the Voice as Transmitted over a Public Address System and over a Radio," *Journal of Applied Psychology*, XXIII (1939), 586–601.

[6] "Judgment of Intelligence from the Voice as Transmitted over a Public Address System," *Sociometry*, III (1940), 186–191.

[7] "Judgment of Kretschmerian Body Types from the Voice as Transmitted over a Public Address System," *Journal of Social Psychology*, XII (1940), 151–162.

[8] "The Ability to Judge the Rested or Tired Condition of a Speaker from His Voice as Transmitted over a Public Address System," *Journal of Applied Psychology*, XXIV (1940), 645–650.

[9] "The Ability to Judge Sociability from the Voice as Transmitted over a Public Address System," *Journal of Social Psychology*, XIII (1941), 303–309.

[10] "The Ability to Judge Truth-telling, or Lying, from the Voice as Transmitted over a Public Address System," *Journal of General Psychology*, XXIV (1941), 211–215.

[11] "Judgment of Introversion from the Transcribed Voice," *The Quarterly Journal of Speech*, XXVIII (1942), 226–228.

[12] "Judgment of Leadership from Transmitted Voice," *Journal of Social Psychology*, XVII (1943), 99–102.

[13] F. H. Sanford, "Speech and Personality," *Psychological Bulletin*, XXXIX (1942), 811–845.

J. C. R. Licklider and G. A. Miller, "The Perception of Speech," in S. S. Stevens (ed.), *Handbook of Experimental Psychology* (New York: John Wiley & Sons, Inc., 1951).

Sensitivity of the Judge

Such pessimism regarding the general value of vocal cues as accurate carriers of information, of course, does not mean that they are not important communicative agents in some circumstances and with some individuals. That some judges have unusual sensitivity is reasonable, but experiments testing hypotheses in this area have been few. Although a substantial literature exists concerning the ability of judges to predict test responses or to describe the characteristics of others, not much can be inferred concerning the specific question of differential sensitivity to vocal cues alone. A controversy continues over whether individuals have a *general* ability to judge others accurately.[14] Those who have gone deeply into studies of this sort find many problems in arriving at positive evidence for such a general ability.[15]

The Addition of Vocal Information

Another approach to the general question "Do nonverbal cues perform significant functions in communication?" is to compare vocal and nonvocal presentations of information. A series of studies following this approach indicate that the addition of nonverbal cues does not always increase accuracy.

A typescript of an interview, in one experiment, was a more accurate source of information for predicting the responses of three clients on a Q-sort, an Adjective Check List, and a questionnaire than was either a ten-minute recording of the same interview or a re-enactment by an actor.[16]

Another study suggests that it may be the type of prediction which the judge is to make which is the critical factor in deter-

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[14] G. C. Stone, G. S. Leavitt, and N. L. Gage, *Generality of Accuracy in Perceiving Standard Persons* (Champaign: Bureau of Education Research, University of Illinois, 1954).

V. B. Cline and J. M. Richards, "Accuracy of Interpersonal Perception—a General Trait?" *Journal of Abnormal and Social Psychology*, LX (1960), 1–7.

[15] N. L. Gage and L. J. Cronbach, "Conceptual and Methodological Problems in Interpersonal Perception," *Psychological Review*, LXII (1955), 411–422.

[16] A. E. Grigg, "Experience of Clinicians and Speech Characteristics and Statements of Clients as Variables in Clinical Judgment," *Journal of Consulting Psychology*, XXII (1958), 315–319.

mining whether hearing or reading is the better channel for securing appropriate information. Dealing with verbatim clinical interviews, Luft found that the two channels were comparable for predicting responses to objective clinical test items but that hearing was superior to reading for projective tests. Twenty-eight per cent of the listeners did better than chance in predicting projective responses, whereas no reader surpassed chance expectancy.[17]

Still another study also showed an advantage for hearing. Undergraduates made reliable judgments of aggressiveness from the voices of speakers but could not do so from the content alone as presented by a typescript.[18]

Cohen, however, found that adding vocal aspects of speech did not facilitate judgments concerning the severity of schizophrenia,[19] and Soskin reported that the observation of subjects in role-playing situations did not add to a written presentation of biographical facts when the objective was to describe the characteristics of the subjects.[20]

In summary, studies comparing judgments with and without vocal cues indicate an advantage for typescripts (1) when the task is that of predicting the response of subjects to objective test items or to questionnaire materials and (2) when the task is the identification of the pathological state of schizophrenia. Vocal information, however, may add to accuracy when the purpose is (a) to predict responses to projective tests or (b) to estimate the degree of a particular emotional state which has been defined for the judges.

The Momentary State of Emotional Expression

Studies dealing with whether nonverbal cues successfully communicate strong momentary emotional states indicate that they

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[17] J. Luft, "Differences in Prediction Based on Hearing Versus Reading Verbatim Clinical Interviews," *Journal of Consulting Psychology*, XV (1951), 115–119.

[18] J. A. Starkweather, "Content-free Speech as a Source of Information about the Speaker," *Journal of Abnormal and Social Psychology*, LII (1956), 394–402.

[19] A. Cohen, "Speech Variables in Judgments of Schizophrenia," M. A. Thesis, Northwestern University, 1960.

[20] W. F. Soskin, "Influence of Four Types of Data on Diagnostic Conceptualization in Psychological Testing," *Journal of Abnormal and Social Psychology*, LVIII (1959), 69–78.

do. Ruesch and Prestwood concluded, "Anxiety can be transmitted through sound alone. The cues operating within the therapeutic situation are primarily acoustic. They manifest themselves in frequency, amplitude and timing characteristics." These authors also believe that the changes in vocal characteristics are not uniform from one person to another when subjected to anxiety but are specific for each individual. Some vocal aspects of anxiety are sufficiently common to communicate the emotion at first listening, but close acquaintance with the speaker should increase sensitivity to nonverbal cues to his emotional state.[21]

Another study indicated that the voice of a professional actor conveyed the emotional characteristics which he intended. Furthermore, producing vocal cues which were inappropriate to the verbal meaning caused judges to disagree to a significant extent concerning the message.[22]

The Use of Content-free Speech

Experiments using content-free speech form still another group bearing upon the importance of the nonverbal aspects of voice as a means of communication. These studies fall into two groups.

The first set of content-free studies are those employing electronic filters which eliminate verbal stimuli but retain the vocal sounds conveying nonlinguistic cues. Soskin and Kauffman by this method found that the filtered material conveyed information permitting listeners to classify voice samples according to a check list of adjectives related to emotional states and to the interaction process.[23] Starkweather, also using a filter, found (1)

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[21] J. Ruesch and A. R. Prestwood, "Anxiety: Its Initiation, Communication and Interpersonal Management," *A. M. A. Archives of Neurology and Psychiatry*, LXII (1949), 527–550.

[22] P. E. Kauffman, "An Investigation of Some Psychological Stimulus Properties of Speech Behavior," Ph.D. Dissertation, University of Chicago, 1954.

[23] W. F. Soskin, P. E. Kauffman, and E. Katz, "Judgment of Affect in Unintelligible Spontaneous Utterances," Unpublished manuscript, University of Chicago, 1954. Soskin and Kauffman in another unpublished manuscript, "Intelligibility of Varying Samples of Spontaneous Utterances Filtered to Suppress Frequencies above 550 cps," describe the development of the filter method.

Elsewhere Soskin describes the vocal and verbal components of speech as two separate channels with the one carrying semantic information and the other conveying affective information. He theorized that the vocal

that judges succeeded in separating submissive from aggressive persons both by normal sound records and by those which were content-free and (2) that a slight advantage in sensitivity favored the filtered type of stimuli. Working from typescripts, the same judges were unable to make the distinction.[24]

The second set of content-free studies are those using the alphabet or numbers as a means of projecting certain feelings. Listeners in one experiment succeeded in identifying the feelings of the participants in a psychotherapy role-playing session.[25] In another study listeners identified feelings expressed by reciting the alphabet in 156 out of 240 attempts for *anger,* which had the highest number of successes, and in 50 of 240 trials for *pride,* which had the lowest. Although misidentifications occurred, speakers and listeners clearly shared the same general concepts regarding the relationship of certain vocal cues to designated feelings.[26]

In summary, studies of content-free speech indicate that the voice alone can carry information about the speaker. Judges agree substantially both when asked to identify the emotion being expressed and when given the task of estimating the strength of the feeling. Judgments appear to depend upon significant changes in pitch, rate, volume, and other physical characteristics of the voice, but untrained judges cannot describe these qualities accurately.

Physical Dimensions and Methods of Analysis

The preceding section reported investigations in which listeners relied upon their own natural faculties to receive communicative information through nonverbal vocal cues. A substantially dif-

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channel is the carrier upon which content is superimposed and argued that a conflict between the two creates ambiguity in meaning.—"Some Aspects of Communication and Interpretation in Psychotherapy," a paper read at the conference of the American Psychological Association, Cleveland, September, 1953.

[24] J. A. Starkweather, *op. cit.,* pp. 394–402.

[25] Clare W. Thompson and Katherine Bradway, "The Teaching of Psychotherapy Through Content-free Interviews," *Journal of Consulting Psychology,* XIV (1950), 321–324.

[26] Joel R. Davitz and Lois Jean Davitz, "The Communication of Feelings by Content-free Speech," *The Journal of Communication,* IX (1959), 6–13.

ferent approach is to explore possible correlations between instrumentally measured characteristics and selected criteria.

As yet, however, measurements of physical dimensions of the voice have seldom been in a form suitable for identifying vocal information. Obtaining such measures should be possible; the need is to find a means which will permit the experimenter to follow selected dimensions instrumentally as moment-by-moment variations in mood occur. The findings so far suggest that indicators of emotional expression vary over a period of time for each individual.

Speech Duration

The Interaction Chronograph[27] has yielded highly reliable measures which describe temporally the activities of subjects participating in standardized interviews in which the interviewer behaves in a prearranged and specified manner. The scores do not seem to be related to the content of the interview.[28]

Also in the field of duration Frieda Goldman-Eisler has found (1) that long silences are more consistent and indicative of the individual's style of speaking than are short silences, short actions, or long actions[29] and (2) that the ratio of short to long silences provides a consistent description of vocal activity for both psychiatrists and depressed or talkative patients.[30]

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[27] For a description of this device and for a discussion of the rationale for personality measures derived from it, see the following: E. D. Chapple, "The Interaction Chronograph: Its Evolution and Present Application," *Personnel*, XXV (1949), 295–307; J. D. Matarazzo, G. Saslow, and Ruth G. Matarazzo, "The Interaction Chronograph as an Instrument for Objective Measurement of Interaction Patterns During Interviews," *Journal of Psychology*, XLI (1956), 347–367; E. D. Chapple, Martha F. Chapple, and Judith A. Repp, "Behavioral Definitions of Personality and Temperament Characteristics," *Human Organization*, XIII (1954), 34–39.

[28] J. D. Matarazzo, G. Saslow, Ruth G. Matarazzo, and Jeanne S. Phillips, "Stability and Modifiability of Personality Patterns as Manifested During a Standardized Interview," in P. A. Hoch and J. Zubin (eds.), *Psychopathology of Communication* (New York: Grune & Stratton, 1957).

G. Saslow and J. D. Matarazzo, "A Technique for Studying Changes in Interview Behavior," in E. A. Rubenstein and M. B. Parloff (eds.), *Research in Psychotherapy* (Washington, D.C.: American Psychological Association, 1959), 125–159.

[29] "The Measurement of Time Sequences in Conversational Behaviour," *British Journal of Psychology*, XLII (1951), 355–362.

[30] "Individual Differences Between Interviewers and Their Effects on Interviewees' Conversational Behaviour," *Journal of Mental Science*, XCVIII (1952), 660–670.

Another device which may lead to findings revealing correlations between selected criteria and objective measures of duration is the Duration Tabulator.[31] Results obtained from it compare closely with those secured through perception of duration by listeners.

The Rate of Speaking

Although all studies in this area should be considered as preliminary ones, several investigators have reached tentative conclusions concerning correlations between speaking rate and selected criteria. Frieda Goldman-Eisler interprets (1) speech rate as reflecting the degree of hesitancy and therefore the extent of organization in speech, (2) breath rate as indicating emotional excitation, and (3) the output of speech per breath as a measure of cortical control.[32] F. H. Kanfer found relationships between a high rate of speaking and increased variability to discussions on topics on which the subjects were rated as poorly adjusted.[33] Fairbanks and Hoaglin found that a rapid rate, short durations, and short pauses were correlated with anger, fear, and indifference and that a slow rate was correlated with expressions of contempt and grief. Slowness of speech in expressing grief resulted from lengthening pauses, particularly between phrases, whereas both sounds and pauses were lengthened in indicating contempt.[34] Gottschalk, Gleser, and Hambidge found that patients as compared with normal subjects had long pauses and consequently a slower rate.[35] Sauer and Marcuse discovered that when recording apparatus was placed in view a greater number of words, quicker response, and a faster rate

[31] W. A. Hargreaves and J. A. Starkweather, "Collection of Temporal Data with the Duration Tabulator," *Journal of the Experimental Analysis of Behavior*, II (1959), 179–183.

[32] "Speech Analysis and Mental Processes," *Language and Speech*, I (1958), 59–75.

[33] "Verbal Rate, Content and Adjustment Ratings in Experimentally Structured Interviews," *Journal of Abnormal and Social Psychology*, LVIII (1959), 305–311.

[34] Grant Fairbanks and L. W. Hoaglin, "An Experimental Study of the Durational Characteristics of the Voice During the Expression of Emotion," *Speech Monographs*, VIII (1941), 85–90.

[35] L. A. Gottschalk, Goldine C. Gleser, and G. Hambidge, "Verbal Behavior Analysis: Some Content and Form Variables in Speech Relevant to Personality Adjustment," *A.M.A. Archives of Neurology and Psychiatry*, LXXVII (1957), 300–311.

characterized high-anxiety subjects as compared with those with low anxiety.[36]

A device which may facilitate further studies investigating possible correlations of rate with criteria is the Speech Rate Meter, which detects points of stress and counts them electronically.[37]

Vocal Pitch and Spectrographic Analysis

Spectrographic analysis so far is limited in that the usual apparatus handles only speech samples of short duration. Fairbanks and Pronovost, however, have described differential results obtained by analyzing pitch characteristics in speech samples which actors produced while simulating various emotional states.[38]

Attempts to solve the basic problem are under way. Tarnoczy, for example, has found a way to secure average spectra by superimposing short samples of spectrum records.[39]

Summary

As an exploration of one facet of nonverbal communication this survey of experimental research deals with judgments of personality and human feelings based upon vocal cues. That one can accurately judge personality traits by direct listening seems doubtful, for halo effect and stereotypes interfere with communication through vocal cues. Nonverbal sounds, nevertheless, undoubtedly carry information under some circumstances. They seem valuable, for example, in predicting responses to projective tests, and they indicate the existence of strong, momentary emotional states. The isolation of vocal dimensions prior to judgment is a considerable aid. The physical measurement of isolated vocal characteristics is in its infancy, but further instrumentation may permit the interpretation of nonverbal communication with greater accuracy than is presently possible.

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[36] R. E. Sauer and F. L. Marcuse, "Overt and Covert Recording," *Journal of Projective Techniques*, XXI (1957), 391–395.

[37] J. A. Starkweather, "A Speech Rate Meter for Vocal Behavior Analysis," *Journal of the Experimental Analysis of Behavior*, III (1960), 111–114.

[38] Grant Fairbanks and Wilbur Pronovost, "An Experimental Study of the Pitch Characteristics of the Voice During the Expression of Emotion," *Speech Monographs*, VI (1939), 87–104.

[39] T. H. Tarnoczy, "Determination of Speech Spectrum Through Measurements of Superposed Samples," *Journal of the Acoustical Society of America*, XXVIII (1956), 1270–1275.

JUDGMENT OF EMOTION IN WORD-FREE VOICE SAMPLES

WILLIAM F. SOSKIN AND PAUL E. KAUFFMAN*

As the preceding article by Starkweather indicates, many research workers have recognized that human speech contains more information than that contained in the words themselves. The present paper presents the rationale, the methodology of two experiments, the results of these studies in the area of nonverbal communication, and a brief discussion of the findings.

RATIONALE

That infants interpret voice sounds before they understand language and that a visitor to a foreign land can sense the emotional state of speakers even though he cannot comprehend the words themselves are two common examples of the existence of nonverbal communication in ordinary human discourse. That listeners sometimes sense that the speaker's tones belie his words is a somewhat subtler examination of the same phenomenon. Little is known, however, of the extent of this nonverbal communicating, of the circumstances facilitating its occurrence, or of the accuracy with which messages concerning feelings are thus transmitted.

Essential to experimentation is the fact that normal human speech consists of two simultaneous sets of cues—the articulated sound patterns forming words, phrases, and sentences and the discriminable qualitative features of voice itself. The former set of cues constitute a rapidly changing succession of stimuli which present semantically meaningful material. The latter, an amalgam of physical properties forming a relatively smoothly flowing, continuous signal, is the carrier upon which articulated sounds are imposed. And it is in this "carrier" that major cues to emotional disposition may reside.

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* Mr. Soskin is research psychologist at McLean Hospital and Mr. Kauffman is the director of research at Hawthorn Center. The work which they report here was carried out while both writers were at the University of Chicago. The project was partially supported by the Air Research and Development Command, Contract AF 18 (600)-166, Air Force Personnel and Training Research Center, Randolph A.F.B.

Method

Isolating the "carrier" from articulated phonemes constitutes a formidable barrier to studying voice sounds alone as communicative agents. Creating simulated human tones through mechanical or musical sources and having subjects attempt to produce emotional utterances by vocalizing a series of vowels or nonsense syllables are two approaches which the writers regard as unsatisfactory. Spontaneous utterances in a foreign language are more acceptable than mechanically produced sounds or nonsense discourse, but samples of spontaneous foreign speech are difficult to obtain and inflectional variations from one language to another pose questions of validity.

The approach which the writers elected to follow was that of trying to isolate the carrier in recorded speech by filtering out the high frequency sounds which carry the semantic portion of communication. The fact that vowels, which in general carry the tonal qualities, are low frequency sounds and that consonants, which in general convey semantic meaning, depend upon the high frequencies in the speech sound range, renders the use of a low-pass filter a practical device for accomplishing the purpose which these experiments require.[1] The assumption is that suppressing the "highs" by such a filter leaves as a remainder a contentless flow of voice which still retains some of the major affect cues.

The specific filters used in these studies passed frequencies within the ranges of 100–450 cps or 150–550 cps.[2] A number of studies of word recognition in filtered excerpts from social conversations, psychotherapy sessions, and lectures indicate (*a*) that the number of words which listeners identify is only two to three

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[1] Investigations of the influence of sound wave frequency on the intelligibility of speech establish that low frequency waves are essential to vowel production, whereas the higher frequencies are critical to the formation of consonants. Furthermore, low frequencies carry much of the speech power and high frequencies very little. In a radio or telephonic system, for example, eliminating a band of low frequencies decreases power but has little effect on intelligibility, whereas suppressing high frequencies produces converse results. Major studies in this area include those of Harvey Fletcher, *Speech and Hearing in Communication* (New York: D. Van Nostrand Company, Inc., 1949) and N. R. French and J. C. Steinberg, "Factors Governing the Intelligibility of Speech Sounds," *Journal of the Acoustical Society of America*, XIX (1947), 90–119.

[2] Mr. Craig Goodwin was responsible for the exploratory work on the design and the construction of the filter used in these studies.

per cent of the total, (*b*) that most of the words which are identified are prepositions, articles, and conjunctions, and (*c*) that in samples of 50 to 150 words in length the two to three per cent level of accuracy would be attained by guessing.[2] The filtered voice sounds, thus, appear to provide valid samples of material for experimental studies of nonverbal communication.

Results

The objective in both of the studies reported here was to determine whether judges could identify emotional states through voice samples filtered so that language and situational cues were removed. These experiments are two of the early ones in this field by the writers.

Study I

The first study employed fifteen male voice samples which expressed a considerable amount of emotion in recordings excerpted from "real life" situations. Varying in length between fifteen and twenty-five seconds, all of the samples were tested to establish their semantic unintelligibility after filtering.

Judges for the study were forty-nine Air Force officers who had had no previous experience in tasks of this type. The samples were arranged on a single tape so that each was played twice in succession with a brief pause separating the two renditions; after the second playing an interval of about thirty seconds gave the subject time to record his judgment on a check list of thirty-four adjectives arranged into categories as follows:

1. *Neutrality*
   objective
   neutral
2. *Indifference*
   indifferent
   unconcerned
   bored
3. *Pleasantness*
   pleasant
   humorous
   enthused
   joyous
4. *Sympathy*
   sympathetic
   tender
   affectionate
5. *Self-confidence*
   confident
   proud
   authoritative
6. insistent
   forceful
   urgent
7. *Anger*
   irritated
   annoyed
   angry
   sarcastic
8. *Doubt*
   hesitant
   uncertain
   doubtful
9. *Embarrassment*
   awkward
   embarrassed
   ashamed

[2] W. F. Soskin and P. E. Kauffman, "Intelligibility of Varying Samples of Spontaneous Utterances Filtered to Suppress Frequencies above 550 CPS," unpublished manuscript, University of Chicago, 1954.

10. *Anxiety*	11. *Depression*
anxious	sad
nervous	gloomy
fretful	depressed

Through an oversight, two sets of items on the check list, groups 5 and 6, were put together. The combination made this the most frequently chosen cluster for six of the fifteen samples. However, when analyzed separately, these two groups had rather different preference frequencies, and treating them separately for purposes of analysis seemed justified.

Analyzing these data presents certain difficulties. The "accuracy" of these judgments cannot be determined because there is no unequivocal way of establishing that a speaker *was* experiencing "anxiety" or "anger" or "depression" in the situation from which the stimulus recording was taken. Lacking an independent criterion, we only can ask whether listeners agree in classifying the emotional information in a message and whether more specifically the agreement in the judges' choices of a particular cluster of words as characterizing a voice sample is significantly different from chance. But here the clusters of adjectives pose a special problem: they are not all equally general, and the preference of some over others as terms for characterizing voices may be a function of the greater generality of the adjectives rather than of actual or presumed similarities or differences among the voice samples. The necessity for controlling for category popularity dictated the adoption of an extremely conservative method of analysis.

The method of analysis was an 11×15 (adjective categories x samples) matrix containing the frequency distribution of category choices for all voice samples. The significance level of the highest cell frequency for any given voice sample was determined in relation to the cell frequencies in the matrix as a whole. Thus, the significance of a given category frequency for a particular voice sample is contingent upon the frequency distribution in the relevant rows and columns. For example, the probability of the cell frequency 23, found in category 8 for voice sample 4, is the sum of the probability of occurrence of a frequency of 23 or more in each of the other categories for all voice samples. In this case the sum of these probabilities is considerably less than .01.

The results are as follows: For eight of the fifteen samples the category chosen most often by the judges achieved a frequency significantly greater than chance, with $p \leq .01$. For two others, $p \leq .05$. Thus, for two thirds of the samples used in this study there is evidence that relatively unambiguous nonverbal communication about affective states occurred. Whatever the nature of the cues in these samples, in each instance there was a commonly shared meaning that led to similar inferences on the part of the judges.

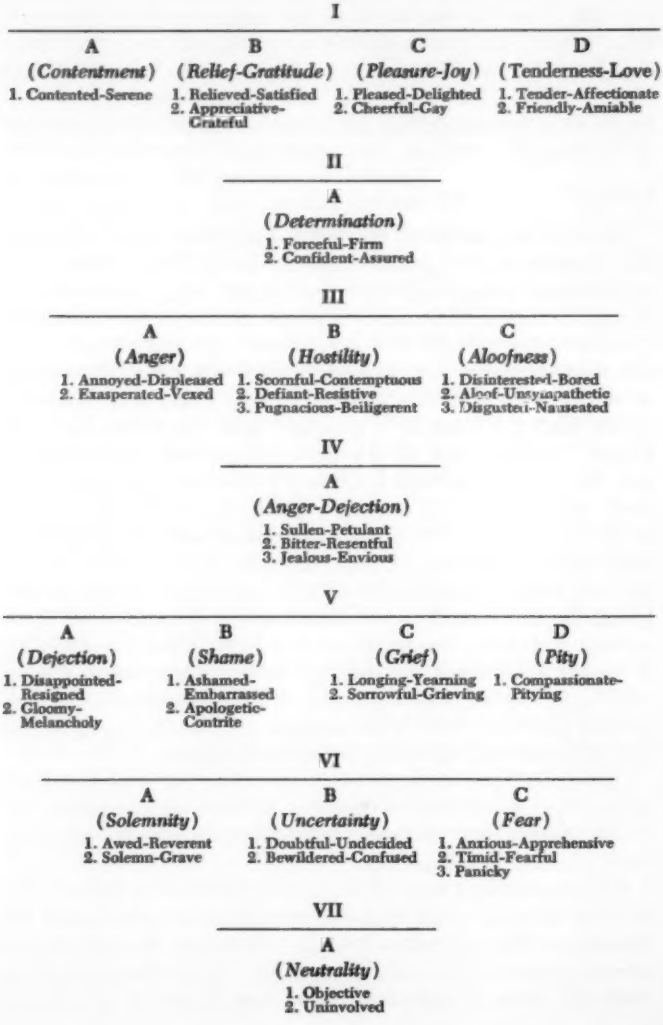
Study II

Although the results of this initial experiment were encouraging, dissatisfaction with the categories and a desire to use more sophisticated judges led to a second study. After a considerable amount of further analysis of voice sounds, the writers developed a classification scheme which assumed major emotional states, intermediate states, and subcategories of the latter. The major states are unnamed, but in a very gross sense they represent "good feeling," "dislike," "sadness," and "apprehension." As Figure 1 shows, four of the major states have subcategories, and each of these in turn is defined by certain word-pairs. The chief advantage of this system as compared with that used in Study I is that it permits an analysis at three levels of specificity—major states, subcategories, and word-pairs. A major shortcoming, and one which complicates statistical analysis, is that not all subcategories are defined by the same number of word-pairs. Thus, symmetry of design was sacrificed in deference to meaningfulness. A second weakness is the dubious internal consistency of some subcategory definitions. *Disgusted* and *nauseated* seem inappropriately placed in III-C-3, for example, and the terms *pugnacious* and *belligerent* in retrospect also seem ill chosen.

Judges for this study were twenty-two men and women ranging in age from twenty-two to fifty-five. Fifteen were graduate students in psychology, four were practicing psychologists, and three were practicing psychiatrists.

Ranging in length from fifteen to twenty-five seconds, the voice samples, all male, were eighteen excerpts from spontaneous life situations. The procedure was to explain to the subjects the general nature of the task, to give them about five minutes to study the affect classification system (see Figure 1) and to play

FIGURE 1
Affect Classification System



two excerpts in order to familiarize them with the sound of filtered voice samples and to acquaint them with the procedure for formulating and recording their judgments. In the experiment itself, each excerpt was played twice with a ten-second pause between the two renditions. Judges had thirty to forty seconds after the second playing to formulate and record their judgments. They responded at all three levels of specificity—e.g., I-C-2 or III-A-3.

The analysis of the data sought to determine whether the judges agreed significantly at the three levels—i.e., the major affect states, the subcategories, and the word-pairs. Table 1 reports the modal category preferences for each of these three levels and the *p*-level in each instance where the cell frequency is significantly greater than chance. The method of analysis was the same as that employed in Study I.

The first analysis, which Roman numerals designate in Figure 1, was performed on the grossest groupings. In this seven-category analysis, thirteen of the eighteen samples were characterized by

TABLE I

Preferred Categories and P-Values of Judges' Classification of Emotion in Eighteen Voice Samples

Voice Samples	Type of Affect					
	Major State	P	Subcategory	P	Word-Pair	P
1	V	.01	V-A	.01	V-A-1	.05
2	III	.01	III-A	.01	—	—
3	I*	—	—	—	—	—
4	V	.01	V-A	.05	—	—
5	III*	—	—	—	—	—
6	I*	—	I-A*	—	I-A-2	.05
7	V	.01	V-B	.01	V-B-2	.05
8	V	.01	V-A	.01	—	—
9	III	.01	III-B	.01	—	—
10	I	.01	I-D	.01	I-D-2	.05
11	I	.05	VII-A	.05**	—	—
12	III & V	—	—	—	—	—
13	III	.01	III-B	.01	—	—
14	I	.05	I-A	.01	I-A-2	.05
15	IV*	—	IV-A	.01	IV-A-2	.05
16	I	.01	I-D	.01	—	—
17	I	.01	—	—	—	—
18	V	.01	—	—	—	—

* Clearly the greatest frequency, but not significant.

** VII-A had a proportionally higher frequency than any of the subcategories in I.

cell frequencies significantly different from chance—eleven with $p < .01$; two with $p < .05$. For the remaining items the modal cell frequencies were only slightly greater than chance expectancy. All of the voice samples for which significant *p*-values were obtained were for groups I, III, or V.

In the analysis of seventeen subcategories the voice sample characterizations which were significant in the grossest groupings again were significant with a single exception. Ten samples achieved cell frequencies beyond the .01 level; the other two *p*-values were beyond .05.

Even at the word-pair level there was some agreement. In six instances judges' agreement on specific word-pairs was significant at the .05 level.

Summary and Discussion

These studies provide experimental verification of the generally held view that voice sounds alone, independently of semantic components of vocal messages, carry important clues to the emotional state of a speaker. The stimulus materials employed in these studies were samples of spontaneous speech produced in a variety of naturally occurring life situations; thereby, a common weakness of earlier studies—the use of simulated emotional stimuli—was obviated. The influence of semantic cues on judgments was effectively eliminated by filtering out the high frequencies and thus reducing intelligibility to the level of chance guessing.

Although the precise nature of the vocal cues which make such judgments possible is unclear, the experiments do establish that the sounds within a relatively narrow carrier band (100-550 cps), at least for the kinds of voice samples used in this study, are sufficient for the transmission of generally identifiable cues to the emotional state of the speaker.

The failure of judges to achieve high agreement on a number of the voice samples suggests the need for much more systematic work. Although these failures may arise from the ambiguity of some cues and/or the shortness of the excerpts used, a more important factor may be the differential importance of certain of the higher frequencies as cues for distinguishing certain emotional states. Still another possibility is that the elimination of semantic "guides" reduces the number of kinds of emotion popularly thought to be discriminable.

NONVERBAL VOCAL COMMUNICATION OF FEELING

JOEL R. DAVITZ AND LOIS JEAN DAVITZ

The following summary centering upon the research of two persons interested in nonverbal communication does not purport to present a complete or even a typical overview of the field. Instead, the objectives are (1) to present some information concerning rationale, the problems, and the methods of research in this area and (2) to report a series of findings and to point out further opportunities for experimentation.

PRACTICAL IMPLICATIONS OF NONVERBAL RESEARCH

Foreseeable applications are not a necessary test for scholarly research, and the eventual usefulness of knowledge concerning nonverbal communication probably will exceed the presently known or predictable values. A practical consideration, nevertheless, was responsible for the series of experiments which the writers have performed. While supervising students in a psychological practicum, they discovered that these inexperienced counselors, although having little difficulty hearing the verbal content of their clients' speech, frequently missed the emotional meanings conveyed by nonverbal cues. Communication between counselor and client often was impaired, and thus sensitizing students to the nonverbal facets of emotional communication became a major teaching objective.

RELIABILITY OF NONVERBAL COMMUNICATION

The writers' first study was concerned with whether relatively untrained speakers could communicate feelings reliably by content-free, nonverbal speech.[1] Recalling an old and perhaps apocryphal story that Sara Bernhardt could elicit tears by merely reciting the ABC's, they asked speakers to express ten different feelings by reading aloud parts of the alphabet. Listeners, so the results showed, correctly identified the expressions far beyond chance expectation; their success, however, was not uniform. Anger, for example, was identified correctly 65% of

[1] J. R. Davitz and Lois J. Davitz, "The Communication of Feelings by Content-free Speech," *The Journal of Communication*, IX (March, 1959), 6–13.

the time, but pride and love were identified in less than 25% of the instances. Nor were speakers and listeners equally skillful in the accuracy with which they respectively expressed and identified feelings.

Objective Expression as Related to Subjective Feeling

The next study began with the observation that various emotional expressions were identified with different degrees of accuracy. To account for this differential accuracy in communication, the writers assumed that discriminating between two objectively similar vocal expressions should be more difficult than discriminating between two which are unlike. But what accounts for objective similarity or dissimilarity? Could *objective* similarity of expression be a function of experienced or *subjective* similarity of the feelings portrayed? If this is true, the accuracy of discrimination between the expressions of two feelings should be inversely related to the subjective similarity of those feelings. The writers designed a study to test this prediction and also to investigate the relations between accuracy of communication and each of three dimensions of the subjective experience of feelings—strength, valence, and activity level.[2]

The results were moderately positive. Accuracy of communication and subjective similarity to other feelings do indeed covary; the correlation of –.29, while statistically significant, does not, however, have much predictive value. Other findings were (1) that in pairs of similar feelings, the one which is stronger subjectively tends to be communicated more accurately, and (2) that both valence and activity level *per se* are independent of accuracy of communication.

Notwithstanding the only modest degree of certainty ascribable to the specific hypotheses investigated, the results provided some evidence of a lawful relationship between two different classes of events: the content-free, or formal, aspects of speech, and the subjective experiences of the feelings expressed. This finding had an important implication for subsequent research because it focused attention on the need to define with greater specificity

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[2] J. R. Davitz and Lois J. Davitz, "Correlates of Accuracy in the Communication of Feelings," *The Journal of Communication*, IX (Sept., 1959), 110–117.

the nature of the relationship between emotional experience and the objective characteristics of vocal expression.

Relation of Emotional Dimensions to Speech Characteristics

Following this lead, the writers set out to define the nonverbal vocal cues associated with the communication of specific emotional meanings.[3] Two sets of variables, the one concerned with dimensions of emotional meaning and the other pertaining to speech characteristics, were the basis for this experiment. As a result of Osgood, Suci, and Tanenbaum's research,[4] three aspects of emotional meaning were defined: (1) *Valence* (pleasant-unpleasant); (2) *Strength* (strong-weak); and (3) *Activity* (active-passive). The four speech characteristics were (1) loudness, (2) pitch, (3) timbre, and (4) rate. Using a set of rating scales derived from the Semantic Differential, judges described each of fourteen different feelings in terms of their own emotional experiences; these ratings operationally defined the *Valence*, the *Strength*, and the *Activity* levels of each feeling. The next step was to obtain vocal expressions which accurately communicated each feeling and to judge these recordings for loudness, pitch, timbre, and rate. These data then provided a basis for studying the relation between each aspect of emotional meaning and each characteristic of speech.

Both *Valence* and *Strength*, according to the study, were related curvilinearly to each of the speech variables, but none of the correlation ratios were large enough to provide a reliable basis for generalizing beyond the experimental data. However, the results for *Activity* level were linear and strikingly positive; to be exact, correlations between rated *Activity* and the separate speech variables ranged from .59 to .88. Subjectively rated "active" feelings, such as anger or joy, were expressed with a relatively loud voice, high pitch, blaring timbre, and fast rate; "passive" feelings, such as despair or boredom, in contrast, were expressed with a relatively quiet voice, low pitch, resonant timbre, and slow rate. At least four nonverbal characteristics

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[3] J. R. Davitz, "Vocal Correlates of Emotional Communication." In preparation.

[4] C. E. Osgood, G. J. Suci, and P. H. Tannenbaum, *The Measurement of Meaning* (Urbana: University of Illinois Press, 1957).

of speech, therefore, consistently covary with one aspect of emotional meaning: specifically, loudness, pitch, timbre, and rate are positively and linearly related to the subjectively rated *Activity* level of the feeling communicated.

Operationally, *Activity* was defined by subjective ratings; conceptually, however, the general construct of activation parallels Lindsley's physiological theory which accounts for emotion in terms of the organism's particular level of physical activation or energy mobilization. These items suggest a possible bridge between a physiological and a psychological point of view. If the individual's experience of his physical state of activation when emotionally aroused is reflected in his subjective ratings describing the *Activity* level of a given feeling, the expectation that vocal sounds which communicate feelings of different subjective levels of *Activity* are characterized by different levels of energy expenditure is reasonable. Experimental findings, as reported above, support the conjecture, for the mode of expressing active feelings was loud, fast speech, which obviously necessitates relatively more energy than does the soft, slow speech of more passive feelings. These speculations, of course, are highly tentative and merely suggestive. Nevertheless, if further research demonstrates a consistent relation between physiological and psychological measures of activation, the concept of activity promises the possibility of integrating a physiological theory of emotions with a psychological theory of nonverbal emotional communication.

Related Studies

As the writers proceeded with their research, others became interested in the same general area and investigated a variety of related problems. For example, Michael Beldoch studied the generality of emotional sensitivity to nonverbal communication in various media.[5] First, he developed reliable measures of emotional sensitivity in three different nonverbal modes of expression: vocal, musical, and graphic. Then, administering all three tests to a large group of subjects, he found that abilities to identify feelings in all three media are significantly intercorrelated. Thus, emotional sensitivity to nonverbal communication appears to be

[5] M. Beldoch, "Interrelationships among Abilities to Identify Emotions Expressed Vocally, Musically, and Graphically." In preparation.

a general factor rather than one which is specific to particular modes of expression. In other words, a person who is responsive to musical and/or graphic cues to emotional states is also likely to be sensitive to the "messages" in nonverbal vocal sounds.

In a related study Phyllis Kempner[6] investigated the interrelations among three aspects of nonverbal, emotional communication: (1) ability to identify others' expressions of feelings; (2) ability to express feelings to others; and (3) ability to identify one's own expressions of feelings. Miss Kempner found these three variables to be positively and significantly interrelated. The implication again, as in Beldoch's study, is that a general factor underlies a variety of operationally different phenomena in the area of nonverbal communication.

Two additional studies have dealt with the emotional sensitivity of specific groups: John Turner's research on schizophrenic patients[7] and Sidney Blau's investigation of the blind.[8] Turner, who began with the concept that schizophrenia is a disorder of interpersonal communication, reasoned that a specific aspect of this disturbance might be a decreased emotional sensitivity to nonverbal aspects of speech. Controlling for verbal intelligence and the ability to make judgments about other characteristics of speech, Turner found that in comparison with a nonschizophrenic sample, schizophrenic persons, on the average, are indeed less sensitive to nonverbal vocal communications of emotions. But Turner also found a small group of schizophrenic patients who were unusually sensitive to emotional communications—a particularly intriguing lead for further research in view of the fact that these unusually sensitive patients did not fit into any one of the usual categories.

Blau started his investigation with the knowledge that the literature about blind persons contains an apparent conflict. On the one hand, folklore notions about the unusual auditory sensitivity of the blind are prevalent; on the other, research has demonstrated no significant difference in auditory acuity between blind

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[6] Phyllis Kempner, "The Ability to Express and Identify Feelings." In preparation.

[7] J. Turner, "Auditory Perception of Emotion by Schizophrenic and Normal Persons," Ph.D. Dissertation, Columbia University, 1959.

[8] S. Blau, "The Transposition of Sensory Modes among the Blind: An Ear for an Eye." In preparation.

and sighted subjects. In fact, some theorists have suggested that blocking one mode of perception, such as vision, dulls other modes, such as audition.

In addition to studying several other variables, Blau compared blind and normal adolescents for their reaction sensitivities to emotional communication (i.e., the tendency to "listen for" expressions of emotion in everyday speech) and for their abilities to identify nonverbal, vocal expressions of feeling. He found that as compared with the sighted the blind are (1) more reaction sensitive to emotional communication and (2) less accurate in identifying the feelings expressed. Thus, although the blind tend to "listen for" emotional expressions in speech, they are less accurate than the sighted in interpreting nonverbal, vocal cues correctly—a finding which has important implications not only for a theory of emotional communication but also for the adjustment and the training of blind persons.

Conclusion

The writers' current studies are concerned with various problems, which range from the chronological development of emotional sensitivity to an investigation of the rhythmic cues of emotional expressions. They also are investigating relationships of individual personality differences to sensitivity—so far with results which are largely negative. As experimentation in this area has been continued, the number of researchable questions has multiplied far faster than have the answers which have been found for the initial problems. No general, systematic theory of nonverbal emotional communication has emerged, but the discovery of consistent, lawful relationships in the data provides a growing empirical basis for such a general theory.

The Hidden Persuaders

A good many of the people-manipulating activities of persuaders raise profoundly disturbing questions about the kind of society they are seeking to build for us. Their ability to contact millions of us simultaneously through newspapers, TV, etc., gives them the power, as one persuader put it, to do good or evil "on a scale never before possible in a very short time."—Vance Packard, The Hidden Persuaders.

SPEECH INTELLIGIBILITY: A SUMMARY OF RECENT RESEARCH*

JOHN W. BLACK**

During the last ten years progress toward an understanding of speech intelligibility has been substantial. The present paper, although not attempting to be definitive, is a synthesis of some important findings in respect to (1) the intelligibility of a communication system, (2) the intelligibility of the word, and (3) errors in intelligibility.

The particular object of the present discussion is to note recent developments concerning *intelligibility* as an instrument which scholars and technicians may apply both in engineering and beyond it. These developments pertain to the lawfulness that investigators are finding among the outcomes of intelligibility tests. As the results establish "laws" and provide knowledge of factors related causally to intelligibility, we may expect these new facts to influence both technical specifications and pedagogical goals in the speech classroom.

The concept *intelligibility* is "asemantic"; it does not relate to the query "What does he mean?" Rather, it pertains closely to the colloquial interrogative command "Huh?" Perfect intelligibility occurs when the symbols which a hearer writes on a paper correspond exactly to those on the paper of the speaker. In turn, any discrepancy between the two papers indicates imperfect speech intelligibility. The symbols may be nonsense syllables, words, or sentences. Whether they convey meaning effectively is quite another matter; the two aspects of communication come together only in that sometimes the factor which impedes understanding is a failure to identify words.

Intelligibility usually implies a testing circumstance and a quantitative outcome—a score. Causality is inherent in a situa-

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* Starred articles are those which are part of the series commemorating the decennial of the NSSC. They either assess the developments of the last ten years in regard to a particular aspect of the total field of communication, or they analyze the present status.

** John W. Black, Professor of Speech and Director of Speech and Hearing Science, Ohio State University, has been identified with military research on voice intelligibility since 1943 (except for 1946). Currently he is conducting studies for the Office of Naval Research.

tion that yields an intelligibility score; a high score in a properly designed experiment suggests that the variable which is under investigation is contributing to intelligibility. This technique of measurement is rooted in the evaluation of communication equipment; for thirty years it has provided a criterion for recommending one telephone system or component over another.

The Intelligibility of a Communication System

Basic to research pertaining to the intelligibility of a communication system is the assumption that the properties of a spoken signal are capable of division and summation. *Half-speed, twice as fast, half-loudness,* and *double-loudness* are reasonable concepts. Similarly, if a set of transmitted symbols is eighty per cent intelligible, some adjustment of the system should yield forty or sixty per cent intelligibility. In other words, engineers should be able to manipulate the factors producing intelligibility, and their knowledge of these factors should enable them to predict the qualities of a communication system. Research substantiates this assumption.

Auditory Properties Critical to Intelligibility

Two related properties of the auditory signal hold the key to intelligibility: first, the signal, even if momentary, has an over-all level, strength, or intensity; and second, this fleeting acoustic pressure is a singular admixture of frequencies or bands of frequencies of measurable level. Moreover, both properties are highly variable. The range of a human voice from the softest vocalization to the loudest shout is about forty decibels (db), and the level of an accented syllable is several db higher than that of the adjacent unaccented ones. Even the oral vowels are unevenly strong. As *fall, fail, fill, feel* are spoken without emotion, the voice covers a range of 4–6 db with the first word (*fall*) being the strongest and the last (*feel*), the weakest. Again, the vowels of these words are 14–20 db more intense than the weak initial consonant [f]. Speech is indeed a succession of moments of differing intensities, and throughout it is susceptible to being drowned out—that is, masked—by either momentary or continuous competing noises. Speech intelligibility, in summary, is highly dependent on signal intensity!

The second ingredient of the speech signal is bands of fre-

quencies, acoustic and audible ones. These minute variations in air pressure, over a range from approximately 100 to 8,000 cycles per second (cps), are adequate in speech to influence the movement of the eardrum and to affect the internal organ of hearing. As frequencies that are distributed about two or three particular values below 3,000 cps are reinforced and made somewhat more intense, one or another of the vowels is produced. For example, the [a] of *father* is singularly dependent on bands of frequencies centered at 800–900 and 1100–1300 cps. Similarly, as a broad band of the frequencies above these is emphasized, one of several consonants, as the first or the last sound of *first, sixth,* or *twelve* materializes. Speech, thus, is a succession of transitory moments of groupings of frequencies, and speech intelligibility is closely dependent on the ear's detecting a succession of agglomerations of frequencies. Intelligibility exists because the ear is selectively sensitive to these variations in cycles. A voice, of course, also has the properties of pitch and rate, but these characteristics ordinarily do not affect intelligibility. Ours is not a tone language, and native-born speakers are unlikely to mismanage the pitch of the voice in a way which affects intelligibility adversely. Similarly, rate is a factor only when rapidity impairs the quality of articulation; otherwise, the ear can accept fast speech.

Major Findings

These two principal dimensions of speech intelligibility—intensity and spectrum—have been difficult to relate to intelligibility in a comprehensive manner, but some facts are known. A slight change in the sound pressure of a message makes a lot of difference in its intelligibility, and the amount which is critical depends upon the nature of the material that the speaker is attempting to transfer to the hearer. In the case of nonsense syllables an increase of twenty-five db in signal strength can raise the percentage of correct responses from twenty-five to seventy-five. On the other hand, the amount of increase required to achieve improvement from the level of 25% to 75% is only eight db when the test material is sentences, fifteen db when the problem is to make a correct choice from four words similar in sound, and five db when the material is common two-syllable

words spoken with equal stress.[1] (Lists of spondees, such as *horseshoe*, have been assembled; they are useful in auditory testing.)[2]

Spectrum is similarly difficult to subject to inclusive laws. For example, at what frequency might the spectrum be divided with the upper and the lower portions of it contributing equally to intelligibility? The answer again depends on the kind of material the talkers want to get from one set of notebooks to another. If the material is nonsense syllables, the division falls at about 1600 cps; if common monosyllablic words, at about 1200 cps; and if the task is to differentiate among four similar-sounding words, also at about 1200 cps.

These facts have opened the way to a solution to the relation between intelligibility responses on the one hand and the physical complex of sound pressure level and acoustic spectrum to which the ear responds on the other. Obviously the upper and the lower equally contributing ends of the divided spectrum are important factors in determining intelligibility. The one remaining when the other is eliminated produces only sixty-eight per cent intelligibility for nonsense syllables and eighty-seven per cent when the task is to identify a spoken word from four which are similar in sound.

Intelligibility Index

This background brings us to a major need that was clearly evident a decade ago—a need for an index in which the intelligibility of a full-strength signal over a full-band system and of a signal of limited intensity or limited bandwidth equals a predictable portion of unity. Thus each of two equally contributing halves of the spectrum would yield one-half unity. The score contributed by either of the halves might be matched to the intelligibility of a full-band signal attenuated to a particular level. The trading back and forth between bandwidth and signal level might ensue until twenty equally contributing frequency bands would be specified. (This could be any other number of bands.)

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[1] K. D. Kryter, "On Predicting the Intelligibility of Speech from Acoustical Measures," *Journal of Speech and Hearing Disorders*, XXI (1956), 208–217.

[2] Hallowell Davis and S. Richard Silverman, *Hearing and Deafness*, Rev. ed., (New York: Holt, Rinehart and Winston, Inc., 1960), Appendix, pp. 535–552.

Any of these bands could be held accountable for five per cent of the total frequency-intensity complex that evokes complete transmission of symbols from one paper to another by means of talking and listening. This is the articulation or intelligibility index, and the extension of the concept of the index has been of special importance.[3]

Since the articulation index lends itself to extrapolation and since the influence of environmental noise and the reverberation time of a room upon intelligibility can be computed and the result subtracted from the ideal intelligibility values, the acoustical engineer now has a new tool. Whereas his competence once lay in predicting the reverberation time of an auditorium from the architect's plans, and whereas it later extended to predicting noise levels in a community or a building and the reaction of the citizens of a community to these levels, he now can predict intelligibility. Although some architects continue to treat acoustical matters as secondary ones during the conceptual stages of a building, many have come to seek the acoustical engineer who can make this type of prediction.

The Intelligibility of a Word

In addition to being a succession of bands of frequencies changing from moment to moment, the word also is a series of phonemes or of speech sounds occurring about fifteen times per second. Phonetic analysis in conjunction with intelligibility testing has provided a technique for calculating the intelligibility value of a nonsense syllable. During the 1920's research workers computed relative values for phonemes through experiments in which nonsense syllables were spoken and heard. The hypothesis was advanced that the intelligibility of the nonsense syllable equals the joint intelligibility or joint probability of the constituent sounds. Thus, if the intelligibility of the member sounds of [kas] were 0.7, 0.8, and 0.6 respectively, the computed measure for the syllable would be the product of the three or 0.34. The approach worked. Could it be transferred directly to words?

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[3] Cf. Kryter, *loc. cit.*; H. Fletcher and R. H. Galt, "The Perception of Speech and Its Relation to Telephony," *Journal of the Acoustical Society of America*, XXII (1950), 89–151; J. W. Black, "Equally Contributing Frequency Bands in Intelligibility Testing," *Journal of Speech and Hearing Research*, II (1959), 81–83.

To do so seems logical, for most persons are accustomed to thinking that a word is a product of its constituents. Moreover, the greater a scholar's orientation toward phonetics, the more plausible does the hypothesis seem.

Experimentation, however, does not produce confirmation, and indeed the presumption is basically illogical. Since all phonemic intelligibility values are less than perfect (less than 1.0), the longer a word the lower its computed rating. For example, if the two sounds of *all* have values of 0.9 and 0.8, the predicted value is 0.7; adding an initial [b] with a value of 0.8 gives an estimate intelligibility for *ball* of 0.6; forming *bald* by adding a final [d] with a phonemic value of 0.7 produces an outcome of 0.4.

The empirical result, however, is different: the longer the word, the higher its intelligibility. The model of joint probability of phonemes must be dropped insofar as words are concerned.

Words and nonsense syllables, although both consist of phonemes in sequence, are not alike in respect to intelligibility. The phonemes of words occur with a predictable and an unequal frequency. Moreover, a particular phoneme is more likely to be followed by some sounds than others. This foregone knowledge of "the next sound"—least apparent among the three-sound words of English—permits a listener to add educated guessing to the acoustic cues.[4] As a result individuals identify common words more often than they do those which are unfamiliar. In one experiment the percentage of accurate listener responses declined steadily from seventy per cent for words chosen from Thorndike's most frequent 1,000 words to sixty per cent for words from the tenth thousand.[5]

Obviously, matters other than phonetic intelligibility contribute to the hearing of a word, but just as surely some amount of phonetic intelligibility is essential to the right identification of a spoken word. One simply doesn't say *cat* and have it written as *lost*. Phonemes do count!

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[4] J. W. Black, "The Information of Sounds and Phonetic Digrams of One- and Two-Syllable Words," *Journal of Speech and Hearing Disorders*, XIX (1954), 397–411.

[5] J. W. Black, "Accompaniments of Word Intelligibility," *Journal of Speech and Hearing Disorders*, XVII (1952), 409–418.

Currently, the best estimate of the amount of phonetic recognition value that is essential for identifying a word is a number equivalent to the product of the intelligibility values of the first two phonemes. This theory does not mean that all of the recognition-value of these two phonemes will be utilized, nor does it say that the remaining phonetic elements contribute nothing to correct reception. In general, however, the product of the relative intelligibility of the two initial phonemes is an accurate estimate of the relative intelligibility of the word.[6]

Prediction of Errors in Intelligibility

Attempts to identify words are, of course, only partially successful, and the errors that occur hold increasing interest to research workers and to those applying knowledge of intelligibility to practical situations. A word that is sixty per cent intelligible is likewise forty per cent unintelligible. The nature of these errors, which are words from the same language as the stimuli, is predictable. First, errors in a free-response listening test are distributed in a pattern possessing these characteristics: (*a*) on an average the most frequent error-response to a word occurs with double the frequency of the second most common mistake; (*b*) the third most frequent wrong choice bears a 6:10 ratio to the one ranking second; and (*c*) the five most frequent error-responses account for one half of the total number of mistakes. For example, if two hundred listeners produce a relative intelligibility score of sixty per cent for the word *take*, the eighty errors might fall in this manner.

20 bake	2 tame
10 lake	2 tick
6 gate-gait	(40 scattered responses)

Second, in a controlled response test errors in hearing again fall into a 20-10-6 relationship. To continue the example contained in the above list, if listeners were asked to identify *take* from a four-word multiple-choice group—*take, bake, lake, gate*—and if the total number of mistakes were eighty, the number of responses to the three wrong words would be approximately 43,

[6] J. W. Black, "Predicting the Intelligibility of Words," *Folia Phoniatrica*, XII (1960), 260–272.

24, and 13. Because this ratio is the same in different types of testing circumstances it is called a *constant ratio*.[7]

The *constant ratio* among the errors in writing words that are heard and the orderliness with which errors occur almost brings our discussion to focus on the "statistics of our language" broached twice in earlier paragraphs—once in a reference to the relative frequency of usage of words and again in regard to the conditional probability of a phoneme. Almost invariably the topic comes into discussions of intelligibility, particularly in connection with a listener's responses in the measurement of intelligibility. At present, it is enough to say that the principle of the *constant ratio* moves us far toward an understanding of intelligibility—in this instance completely from the viewpoint of the listener.

Errors are predictable in yet another manner and in a way which emphasizes the fact that phonemes are contributing entities to word intelligibility. Briefly, a given sound tends to be substituted for certain specific sounds but not for others. The most common substitutions are plosives for plosives, voiced sounds for their voiceless correlates, and voiceless phonemes for their voiced partners.[8]

Conclusion

Intelligibility is being tied down; its lawfulness discovered. This basic progress probably is of more consequence than are the recent applications of intelligibility to audiometry, to textbooks for courses in the Fundamentals of Speech, to Voice and Diction classes, and to criteria used in research studies. In particular, the relative intelligibility of a word can be estimated, and a number of facts are known about the errors that listeners make in identifying the words of their language. Ahead lies the all-important prediction—the use of the individual's voice as the basis for estimating his relative intelligibility.

[7] James P. Egan, *Message Repetition, Operating Characteristics and Confusion Matrices in Speech Communication* (Bloomington: Indiana University Hearing and Communication Laboratory, 1957).

Frank R. Clarke and Clint D. Anderson, "Further Test of the Constant-Ratio Rule in Speech Communication," *Journal of the Acoustical Society of America*, XXIX (1957), 1318–1320.

[8] George A. Miller and Patricia E. Nicely, "Analysis of Perceptual Confusions among Some English Consonants," *Journal of the Acoustical Society of America*, XXVII (1955), 338–352.

Alan C. Nichols, "An Analysis of Phonetic Errors in Identifying Spoken Syllables," Ph.D. Dissertation, The Ohio State University, 1959.

THE PREDICTABILITY OF WORDS IN CONTEXT AND THE LENGTH OF PAUSES IN SPEECH

FRIEDA GOLDMAN-EISLER*

An earlier experiment showed that hesitation pauses in spontaneous speech are related to the amount of information content in the following word.[1] If the following word possesses low information content (is easy to predict), pauses are significantly less likely to occur than if the following word possesses high information content. The method in the previous experiment for estimating the degree of information content was to have subjects who knew nothing of the speaker's intentions guess what word would follow. If they guessed correctly, the information content was low.

The conclusion from the preceding results was that fluency and hesitation are symptomatic of the amount of information in the following words; in the language of Jackson, fluency is associated with "old, well organised" utterances, which are practiced and automatic, and hesitation is likely to occur when the expression is "new, now organising."[2]

The purpose of the present experiment was to ascertain whether the amount of information content is related to the duration of pauses by readers extemporizing missing words in sentences originally spoken by someone else. If such a relationship exists, the earlier conclusion is corroborated.

MATERIAL

The material of this experiment consisted of four sentences recorded from spontaneous speech. The duration of the hesita-

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* Mrs. F. Goldman-Eisler, who holds the degree of Dr. Phil. (Vienna) and who did her postgraduate research at University College, London, is Research Associate in the Department of Phonetics of the latter institution. The present report is a part of a series of experiments pertaining to a study of the relation between speaking and thinking. The project is supported by the Medical Research Council. The present article is a substantially revised version of one bearing the same title and appearing in England in *Language and Speech*, I (July-September, 1958). Republication is by permission.

[1] Frieda Goldman-Eisler, "Speech Production and the Predictability of Words in Context," *Quarterly Journal of Experimental Psychology*, X (1958), 96–106.

[2] J. H. Jackson, *Selected Writings*, Vol. II (London: Hodder & Stoughton, Ltd., 1932).

tion pauses was measured, and the amount of information content in the words was determined.

These sentences were subjected to two different treatments: (1) each sentence was prepared for the experimental subjects by substituting blanks for the words with high information content; (2) each sentence also was prepared by substituting blanks for words with low information content. These alterations were carried out so that the number of actual words in each corresponding pair of sentences was equal and so that the gaps between the words were fairly distributed. Since words of high and low information content tended to alternate, the processing of the sentences was surprisingly easy.

Procedure

The instructions to the subjects were that they were to read the sentences aloud and to substitute for the blanks the words the most suitable to the context. Proceeding at a conversational pace, they were to pause as they would in spontaneous conversation but were to try to maintain a normal degree of continuity. They were to visualize an imaginary listener waiting for the sentence to come to an end within a reasonable time.

The design of the experiment so ordered the presentation of the two types of sentences that both the effects of learning and the influence of the order of presentation were eliminated. Eight subjects participated.

The readings were recorded on tape, and a pen recorder on teledeltos paper indicated the durations of periods of speech and silence. These recordings made it possible to measure the durations of the interrupting pauses precisely. The rate of reading in syllables per second was calculated from the duration of each reading.

Results

1. Where the gaps stood for words of low information content, the mean length of hesitation before substituting words for the blanks, was twenty seconds; where the gaps stood for words of high information content, the comparable mean length was thirty-seven seconds. This difference is significant at the level of $P = 0.01$ ($F = 8.8$) but some of the variance (significant at the 0.05 level) was between sentences. The individual differ-

ences among readers was of little consequence in determining the length of the hesitations. Thus the amount of *information which a word contains is related to the length of hesitation when a reader fills blanks; the shortest hesitations occur when words contain the least amount of information.* As defined earlier, a word is low in information content if subjects find it easy to predict it on the basis of the preceding portion of the sentence.

2. The times which the subject took to fill the blanks varied widely (between one and ninety-two seconds with one gap of 165 seconds in the tail of the distribution) and their duration obviously differed from that of the pauses of the speakers who had originally produced the sentences spontaneously. A comparison of the length of pauses of the speakers with those of the readers showed that a positive and significant relationship (X^2 = 6.0 and 6.1; P = 0.02) existed for two of the sentences. *Thus for two sentences the completion of gaps concealing words originally preceded by pauses required a significantly longer period of hesitation than the filling of blanks for words uttered fluently. For the other two sentences no such relationship existed.*

A further analysis showed a plausible explanation for these seemingly contradictory results. In the two sentences in which the hesitations in spontaneous speech and in reading were significantly alike, the readers produced the same words as those of the original speaker in a high proportion of the instances (89% and 79.2% respectively for the sentences containing blanks representing words of low information content; 46% and 36.2% respectively when the blanks represented words of high information content). In the other two sentences—those in which the hesitations of readers and original speakers were not significantly alike—the readers were relatively unsuccessful in thinking of the words used by the speakers (59.5% and 52.5% for words of low information content; 13% and 13.4% for words of high information content).

Discussion and Conclusions

The interpretation of the preceding results requires an understanding of the implications of the act of duplicating the original wording. A high proportion of correct words seems to indicate that the sentence schema of the reader was similar to that which

had determined the word choice of the original speaker. In other words, the lines of meaning which guided the reader's verbal thinking and those guiding the thinking of the original speaker were the same. On the other hand, a low proportion of correct choices in completing the experimental sentences seems to indicate that the reader found it difficult to anticipate the direction of the original speaker's thinking.

Thus, readers filling blanks in incomplete sentences have a significantly greater chance of approximating the original version whenever the sentence schema presented allows for a reconstruction of the meaning according to the intention of the original speaker. Further, the lengths of the hesitations of subjects who thought along the same lines as the original speaker were positively related to the lengths of the pauses in the original speech. In those sentences, on the other hand, in which the omission of words reduced information content to the extent that meaningful reconstruction was obstructed, no relation existed between the length of the pauses by readers and those by the original speakers. Those who think alike thus appear to behave alike in the matter of pauses.

A relation is thus shown to exist between periods of hesitation before verbalization in different persons performing different operations within the same linguistic setting. The condition under which this relation holds is one characterized by successful anticipation of the original speaker's intentions.

The previous experiment[3] established a relation between pausing (an aspect of the behavior of speakers) and information content (an aspect of linguistic structure), but the present result goes further. This new study shows that different individuals, provided that they are operating on the same language material and are thinking along identical structures of meaning, will respond in a similar way to the tasks of creating speech and of reconstructing this same speech from fragments. An understanding of the significance of this finding depends upon a consideration of the implications of these two linguistic acts. The earlier experiment[4] concluded that the process of verbalization consists of two parts and that every act of speech is based on an

[3] Goldman-Eisler, *loc. cit.*
[4] *Ibid.*

anticipatory plan possessing a specific structure. Hesitation pauses then indicate a lag between the two halves of the verbalizing process, the "subjective" and the "objective" (in the terms of Hughlings Jackson) or the mental formation of the concept and the physical act of phonetic production. "In old and acquired forms of speech," where the mental process becomes both automatic and subconscious, the physical production of speech is highly integrated and utterances are instantaneous. When the words are being fitted to the proposition anew, on the other hand, hesitations in verbalization are a function of the degree of indecision involved in selecting the appropriate words.

An application of the preceding hypothesis to the results of the present experiment equates the task of completing the experimental sentences to the second stage of the verbalizing process in spontaneous speech. The fact that the durations of pauses in reading and spontaneous speaking were related when the reader successfully anticipated the intentions of the original speaker seems to indicate that both types of pause—those interrupting the utterance of sentences in spontaneous speech and those preceding the completion of blanks in the same sentences—are, in fact, identical in function—i.e., they are related to the selection of words to be fitted into an existing structure.

The fact that the durations of pauses in reading and spontaneous speaking were *not* related when the reader failed to anticipate the intentions of the original speaker indicates that in the absence of such knowledge word selection through sequential dependencies breaks down. Thus, the statistical determination of speech is only one factor in its production, and there must presumably be other factors which account for the generation of the content and for the creation of the framework of grammatical structure within which the substance is verbalized; further, content and organization are primary, and their generation must precede the operation of the statistical principle in word selection.

If this is so, pauses must reflect more than difficulty in word selection; they must reflect also difficulty of thought and sentence construction. A new experiment, which will be reported soon, has tested this hypothesis.

THE MANUAL OF STANDARD OPERATING PROCEDURES

DON PALMER*

Like most large companies United Air Lines finds it necessary to prepare manuals of standard operating procedures to guide employees in many of its departments. In order to find out the reactions to these manuals, the writer conducted a study in which he quizzed a stratified sample of three hundred employees in a series of patterned thirty-minute interviews. The approach was informal—although the items comprising the questionnaire had been carefully prepared and extensively pretested, the writer reworded whenever he felt that doing so was necessary.

Table I presents the results of the survey. Based upon them the writer has prepared the following ten "rules" for preparing manuals of standard operating procedures:

1. A system of job-oriented manuals needs a good index for each manual more than it does an over-all index for the whole system.
2. Planners of company manuals must watch for changed circumstances—e.g., the growing complexity of fixed plant equipment, which may create the need for new manuals, such as a building mechanic's handbook.
3. Without a professional illustrator on the staff, a publications group runs the risk of publishing relatively ineffective technical drawings.
4. Most employees view the reading of company regulations as a pretty dreary and unprofitable occupation.
5. When the communication of changes in procedure is inadequately planned, one result will quite certainly be resistance to change.
6. To communicate changes in procedure efficiently, the instructions should briefly explain the effect (although not necessarily the cause) of the changes.
7. Before writing a sentence in a new manual, the author and the editor should agree on an image of that particular manual's average reader.

* Mr. Palmer is a regulations analyst for United Air Lines.

8. If a manual's input is from a number of sources, its pattern of organization is liable to be according to source—to the distress and confusion of its readers.
9. When each manual in a system is job-oriented, some borderline or hybrid groups may be handicapped by having to use manuals that were tailored for other occupations.
10. Since a person's type of work affects the kind of manual which he wants, those who prepare manuals must recognize that they must adapt their material to the needs and the preferences of a particular group of readers. No average manual reader exists.

TABLE I

A Statistical Survey at United Air Lines of Employee Attitudes Toward Manuals of Standard Operating Procedure

What do you generally use regulation manuals for?	
Learning a new job.	22%
Brushing up on an old job.	56%
Help when things go wrong on the job.	26%
Instructing others.	32%
Checking on policies.	43%
For what group of employees should they be written?	
New employees.	26%
Fairly experienced employees.	38%
The most experienced employees and leads.	13%
Supervisors.	6%
Are they easy to understand?	
Easy to understand.	40%
Fairly easy.	43%
Fairly difficult.	7%
Difficult.	2%
How could they be made clearer?	
Rearrange the material in more logical order.	16%
Use shorter, simpler sentences.	18%
Use more pictures.	22%
Give more examples.	40%
Do they sometimes have any of these faults?	
Out of date; revisions have not been published.	30%
Out of date; revisions have not been inserted.	18%
The writer seems out of touch with the actual work.	24%
Purposely vague and evasive.	5%
The method isn't the best, quickest, most practical.	17%
A person's authority is not clearly spelled out.	6%
How much detail do you like?	
Brief outlines, tables, and diagrams.	58%
Text like a school book with full details.	26%

TABLE I — *Continued.*

In what cases do you like to know the reasons why?	
When a seemingly good procedure is changed.	64%
When procedure is different from what you'd expect.	37%
When procedure is prescribed by the government.	34%
What is the best location for exceptions and irregularities?	
Their logical place among the routine instructions.	42%
At the end of the routine instructions.	49%
How do you prefer to learn about changes in procedures?	
Briefing by trainer or supervisor.	42%
Letter from headquarters.	14%
Bulletin for the manual.	26%
Revision of the manual.	16%
Is it confusing to have a number of sources?	
Yes.	31%
No.	55%
Should transmittal letters tell what is being revised?	
No.	10%
Merely name the parts that are being changed.	22%
Briefly sketch out the new procedures.	15%
Sketch out the new and contrast them with the old.	51%
How many days' notice do you need when procedures change?	
1 to 3.	24%
4 to 7.	20%
8 to 14.	22%
15 to 30.	13%
Is it easy to find things in regulations?	
Easy.	26%
Fairly easy.	40%
Fairly difficult.	19%
Difficult.	8%
How could we make it easier to find things?	
Arrange the material more logically.	16%
Don't split one job between two different manuals.	27%
Improve the General Index.	5%
Improve the indexes in individual manuals.	39%
Reduce the number of manuals.	11%
Increase the number of manuals.	0%
What do you do in cases where procedures are unworkable?	
Do what your judgment tells you.	40%
Ask the boss to make a decision.	28%
Ask to have the manual corrected.	30%
Which of these two pages do you prefer?	
Single column.	32%
Double column.	55%

RESEARCH NOTES

FRANCIS A. CARTIER, *Editor*

Remember "Occam's Razor," the rule that the best explanation is the one with the least components? So many recent research reports and theory papers suffer from a surfeit of implicit and extraneous assumptions and concepts that one is tempted to apply the old Franciscan's blade to some "fundamental" concepts. There is a fascination to pondering, for example, whether we really need the concept of "meaning." Or ask yourself whether we might not better understand what happens in group discussion if we shaved off the entire concept of "leadership" and tried to explain all discussion behavior in terms of the remaining concepts. Consider, too, whether we might not get along quite well without any of these "obviously necessary" concepts: "attention" (this one is tricky, but intriguing), "message" (see the comment in the last issue), "receiver" (for a start, try replacing this exclusively with "perceiver"), and even the noun concept of "communication." I'm convinced we'd be better off without the last one; total restriction to the verb form has a remarkably elucidating effect.

This process of trying to do without a "basic" concept makes a wonderful mental game that any number can play. It is fun and may even lead to better understanding of what we do when we communicate. If you'd like to try this game, here is the one and only rule: No fair eliminating just the word; you must eliminate one whole concept.

P. C. Wason, "On the Failure to Eliminate Hypotheses in a Conceptual Task," *Quarterly Journal of Experimental Psychology*, XII (August, 1960), 129–140.

This ingenious experiment explores the tendency of subjects, faced with the task of deducing a rule from a set of data, to seek only confirming evidence for their hypotheses when both confirming and refutative items are obtainable. The experiment was so designed that a subject could find an infinite amount of evidence confirming most wrong hypotheses. On the other hand, he could find disconfirming data only if he sought for them specifically. Also, the subject who did not seek data which might disprove the most "obvious" hypothesis was almost certain to come to erroneous conclusions. The experiment "demonstrates the dangers of induction by simple enumeration as a means of discovering truth."

We can teach scientific thinking, but the *capacity* for it is not enough.

Also important is the readiness or disposition to think rationally—a quality which may be related less to intelligence or understanding than it is to a willingness to seek refutations as well as confirmations of one's hypotheses. In other words, the ability "to tolerate the disenchantment of negative instances" may be critical to rational thought.

The method of this study provides an ingenious device for a lesson in problem solving.

J. R. Dempsey, "How Can We Understand What We Know?" *Air Force and Space Digest*, XLIII (August, 1960), 67–69.

Decision makers today must function without having perfect personal understanding of current problems. They must rely on committees and boards to make initial decisions. "Rather than decisions," Dempsey observes, "we get diffusions of problems and a spreading of the blame of the consequences." The scientist and the engineer receive new information too fast to evaluate and understand it. We need a "quantum jump" in human information processing. The present situation is dangerous, for decision makers are tempted to grasp at the straws of information which they can understand and to ignore all other items.

M. Ray Loree and Margaret B. Koch, "Use of Verbal Reinforcement in Developing Group Discussion Skills," *Journal of Educational Pyschology*, LI (1960), 164–168.

This study is concerned with the effect of positive reinforcement in developing certain group discussion competencies. Each of four classes was divided into six panel groups. Each conducted a discussion at the beginning of the semester and, on a matched topic, at the end of the term. Two judges, working independently, rated tape recordings of the discussions. In the two control classes, no intervening practice occurred. In the experimental classes, the groups held two additional discussions. Following one of these, the instructor made complimentary comments on each "good" contribution as he played back a tape recording.

Results of an analysis of covariance support the hypothesis that group discussion competencies can be considerably improved by simulating "immediate" reward conditions through the use of stimulated recall techniques. Practice without the "immediate" positive reinforcement had no significant influence on group discussion abilities.

Frieda Goldman-Eisler, "Speech Production and the Predictability of Words in Context," *Quarterly Journal of Experimental Psychology*, X (May, 1958), 96–106.

The purpose of the experiments was to examine the function of hesitation pauses in speech. The hypothesis was that hesitations are related to the information carrying power of the succeeding word. An adaptation of Shannon's guessing technique, using both reverse and forward guessing, provided estimates of the information which the words contained. The facts supported this hypothesis: that hesitancy in speech is closely related to uncertainty of production (entropy) whereas fluency of utterance is related to redundancy. These results were shown to be in line with the facts of language statistics. The author discusses the theoretical implications.

BOOK REVIEWS AND NOTES

MARTIN P. ANDERSEN, *Editor*

INFORMATION AND COMMUNICATION PRACTICE IN INDUSTRY. By T. E. R. Singer. (Editor.) New York: Reinhold Publishing Company, 1958; pp. vi + 304. $8.75.

This book is of particular interest to information specialists—librarians, for example—working in an industrial research environment. It is of general interest to any reader involved in the practical side of organizational communications. The book is rich in references, but is also subject to both the shortcomings and the advantages of multiple authorship, for its material ranges between the academically descriptive and the operationally experienced points of view. Though this weakness creates disappointment, it does not seriously compromise the book's usefulness; rather, it teases the reader into wanting more. He can get more from the bibliographies, which alone are worth the price of the book.

Early chapters particularize the role of information service groups and present some of the task problems which they have met and solved. Library techniques and procedures, including patent searches, automated information retrieval, and even the more esoteric operations research and technical classification theory and practice, receive articulate though brief explication. Julian Smith characterizes this brevity in his chapter on "Linguistics, Language, and Terminology": "(1) know what needs to be said; (2) say it; (3) quit." While Smith's effort could have benefitted from a dose of this medicine, Saul Herner in the very next chapter provides a beautifully focused introduction to the operations research point of view. These and five other chapters not only describe current theory and problems in information services but also evaluate present practices. In a few chapters many of the most costly problems a technical information program can face are delineated, and tested solutions are offered. Such ideas, even *one* such idea, could save many man-months of effort.

One quick example: the chapter on Patent Collections by Gertrude Munafo includes in the footnotes addresses, prices, and dates of publication of key references described in the text; and, amazingly enough, these footnotes even review patent statistics and procedures for classifying and processing patents in Germany, England, France, Canada, and other countries.

The last half of the book treats the technical report similarly. Much of this material is tried and true, but here it is made available in a very brief and very handy form. Irlene Stephens' chapter on technical writing is neat and to the point. Her 139-item bibliography is drawn from an unexpectedly wide range of sources. An Armour Research Foundation Literary Analyst, Ethaline Cortelyou, provides a chapter on technical editing and a unique chapter on designing data tables. Both of these chapters will be of immense value to any technical writing staff. The chapter on data tables, for example, was written for the writer *and* his typist!

Summarily, this is a valuable book. —STUART COONEY

Systems Development Corporation, Santa Monica

BUSINESS COMMUNICATION READER. By J. Harold Janis. (Editor.) New York: Harper & Brothers, 1958; pp. xiv + 369. $4.50.

This anthology presents a collection of fascinating writings on business. Although it seems to lack a unifying thread which might help students pull

together the diverse and interesting material presented, Janis has done an outstanding job.

The author states that "the book arose from the needs of communication courses for business majors." Janis has perceived these needs broadly. First, he has aimed to draw closer together the business writing course and the traditional freshman composition course. His suggested exercises in this connection are broad gauge—for example, "Write an analysis of your own listening habits and tell what you can do to improve them." Only a few are as puerile as "Write a theme on 'Is Correct Spelling Necessary?' " A second aim is to broaden the base of college education for business by providing good reading while not abandoning traditional methods of instruction in composition. History, economics, philosophy, and ethics are represented in Janis' selections. The material ranges from Pope Leo XIII's encyclical on the condition of the working classes to Adam Smith on the making of pins. Janis has achieved his goal of offering selections interesting to the general reader.

Janis has sought to give some ideas on communication itself and the interrelationship of communication media. In this connection, Heilbroner recalls classic ads of yesterday, motivation research is introduced, and the history of radio broadcasting is described.

Although the book aims to present examples of good business writing, this reviewer believes that the writing about business is better than the business writing. Finally, Janis seeks to orient the students in the business world. Selections from *Babbitt, Executive Suite,* and W. H. Whyte's delightful report on the Vick School of Applied Merchandising may not orient the student, but they will vigorously shake some preconceptions.

The anthology should be a useful tool for the business writing teacher. If it has limitations, they are those of our undergraduate business schools, not the author's.

Janis anticipated and seems to sympathize with such recent reports as "Higher Education for Business" written by Robert A. Gordon and James E. Howell and sponsored by the Ford Foundation and Frank C. Pierson's "The Education of American Businessmen," which was sponsored by the Carnegie Corporation. These studies say that undergraduate business training is too vocational and recommend less specialized courses with material from outside business areas and with more emphasis on principles, analysis, and problem solving. Janis pushes as hard in these directions as one can if he is still to produce a palatable reader for job-oriented "BusAd" freshmen.

—R. F. Cautley

Proctor & Gamble, Cincinnati

Managing by Communication. By Willard V. Merrihue. New York: McGraw-Hill Book Company, Inc., 1960; pp. xiii + 306. $7.00.

In this management oriented volume the author develops a distinct, and sometimes indelicate, pro-management philosophy of communication. He also tries to supply some techniques for the application of this philosophy.

The book has a good deal to say, and most often it says it quite well. Mr. Merrihue, who is the Manager of Community and Business Relations for the General Electric Company, is perceptive and informative when dealing with topics such as "Management Philosophy and Practice in the Area of Risk-taking Communication," and "Long-term Communication Planning." On

the other hand, the author seems to equate *communication* with the *engineering of consent* when speaking of the "Use of Communication in Achieving Employee Participation," and the "Use of Communication in Strikes." The chapter on the evaluation of employee communications discusses an "Employee Relations Index," which appears to be a measurement device worth investigating.

Listening training as a communication tool is stressed heavily, as is a positive approach to employee communication. Short shrift is given to those embracing a "too little, too late" communications policy. Some good cases are provided for the examination of communication in an industrial setting. The author displays a commendable familiarity with research data and uses these materials in an eclectic fashion.

Although more material than seems valuable is included on matters peripheral to communication and although I was sometimes annoyed at what seemed to be a "what's good for management is good for the country" attitude, I still recommend this work as a readable record of faith and success in industrial communication by an obviously able and experienced practitioner in the field.

—Frank E. X. Dance

The University of Kansas

General Speech, An Introduction. (Second Edition.) By A. Craig Baird and Franklin H. Knower. New York: McGraw-Hill Book Company, Inc., 1957; pp. x+395. $5.25.

The Fundamentals and Forms of Speech. By Andrew Thomas Weaver and Ordean G. Ness. New York: The Odyssey Press, 1957; pp. x+470. $4.25.

Basic Experiences in Speech. (Second Edition.) By Wayne N. Thompson and Seth A. Fessenden. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1958; pp. xii+444. $5.25.

Fundamentals of Speech. By Elton Abernathy. Dubuque, Iowa: Wm. C. Brown Company, 1959; pp. vi+214. $3.50. (Paper.)

This review considers four speech textbooks representing four radically different approaches to the first course. It is hardly conceivable that a teacher of speech would replace one of these books with any of the others unless he had undergone a complete change in his philosophy of the beginning course.

Baird and Knower have written a traditional book on public speaking, with added material on oral reading and discussion. As compared with the first edition, it is substantially reorganized and rewritten and considerably improved in clarity of presentation. The emphasis of the book is on speech composition, with the treatment of voice and physical delivery essentially functional rather than intensive.

Weaver and Ness offer a book for those who prefer the emphasis on the "fundamentals." Two thirds of the book is an analysis of the nature of the speech process; one third consists of advice about speaking in such forms as conversation, discussion, public address, interpretation, and television. The focus is thus technical rather than functional. The authors seek to provide the student with a "deep and broad foundation for an understanding of all the various manifestations of speech in the individual person and in

the society of which he is a part." "Practical projects for developing skills" form a secondary emphasis.

Thompson and Fessenden present an approach centered on activities, planned in what the authors conceive as the order of psychological difficulty to the performer. The emphasis is primarily on platform speaking with oral reading and discussion presented as simpler activities leading to more difficult skills. The activity centered portion of the book is preceded by a consideration of problems of speech composition and delivery, including a moderately technical treatment of voice production. The formula for speech growth advanced by the authors is "analysis; practice; criticism; improvement."

Abernathy offers the teacher a loose-leaf workbook in the fundamentals of speech. Fundamentals is a much looser term than in the Weaver and Ness text. There is a little of everything in the book, including even a section on defective speech and another containing selections for oral reading. Tear-out evaluation blanks at the back of the book are of varying value. Music and art appreciation blanks seem a little remote from the field of speech. Probably most instructors would prefer to use their own methods of evaluation.

Doubtless no speech instructor is ever completely satisfied with any book except the one he has written or would like to write for himself. Nevertheless, these four texts represent sufficiently varied viewpoints to permit a teacher to select one from which he could teach without too much mental anguish. This reviewer prefers the traditional development of Baird and Knower, but he is quick to admit that many effective teachers will be better satisfied with one of the other approaches.

—Charles W. Lomas

University of California, Los Angeles

A First Course in Modern Logic. Edith W. Schipper and Edward W. Schuh. New York: Henry Holt and Company, Inc., 1959; pp. xviii + 398. $4.50.

Methods of Logic. (Revised Edition.) Willard Van Orman Quine. New York: Henry Holt and Company, Inc., 1959; pp. xxii + 272. $4.75.

A First Course in Modern Logic, according to the authors, assumes that modern symbolic logic can be presented successfully to college freshmen and that this approach is preferable to traditional methods of studying logic. Prior knowledge of mathematics is presumed unnecessary. The arrangement of content permits a selection of material which can be completed in one semester.

Limited to the techniques of deductive reasoning, the book includes sixty-one chapters arrayed in four parts: the logic of meaning, the logic of propositions, the logic of propositional functions, and the logic of classes. The first three chapters identify logic; and in relating logic to psychology, rhetoric, mathematics, and semantics, the authors clearly indicate that the use of logic is a complex matter.

Proceeding step by step in carefully organized units the text appears well adapted to the beginning student. Exercises following each chapter are especially well done, and selected answers in an appendix will prove helpful.

Attractive in format and type, this book should prove useful to many in

the area of communication and should be especially valuable to those in debate and discussion.

The author of *Methods of Logic* states that "This book undertakes both to convey a precise understanding of the formal concepts of modern logic and to develop convenient techniques of formal reasoning." In addition to giving an exposition of logical methods, the author in the last portion deals with "set theory and the foundations of mathematics." Most of the book deals with deductive logic. It is planned for a semester course and is "intended for the general student."

Someone said that one must start from where he stands. Some may stay where they are, others may move but with little purpose, and some may start, travel, and arrive at a destination. The author seems to fall in the last of these three classes. One is impressed with his thoroughness, clarity, and style. The author in this text is both rigorous and interesting.

—R. H. Myers

University of Wisconsin, Milwaukee

Reading Improvement for Men and Women in Industry. By William D. Sheldon and Leonard S. Braam. Syracuse: Syracuse University Press, 1959; pp. 96. $2.50. (Paper.)

Maintaining Reading Efficiency. By Lyle L. Miller. New York: Henry Holt and Company, 1959; pp. iv + 284. $3.50. (Paper.)

Toward Better Reading Skill. (Second Edition.) By Russell Cosper and E. Glenn Griffin. (Editors.) New York: Appleton-Century-Crofts, Inc., 1959; pp. xvi + 299. $1.95. (Paper.)

College Writing and Reading. By Bernard D. N. Grebanier and Seymour Reiter. New York: Henry Holt and Company, 1959; pp. x + 502. $3.85.

The differences among these four books mark the rich range of materials available to all persons who wish to develop their reading ability. The diversity also reminds us teachers that because we may have found one satisfactory book on reading improvement, we should not cease examining others for possible concomitant use.

The stress of the Sheldon-Braam book is upon developing reading "flexibility," or widening the *range* of one's rates of reading. The flexible reader adapts his rate to his purpose, to the inherent difficulty of the material, and to the familiarity of the content to him. The major matter of this book is divided according to these three influences on reading rate.

The Sheldon-Braam book incorporates the methods used by the authors in conducting classes for industrial concerns. The content is divided into a thirteen-week schedule, one assignment per week. This sectioning, plus topical divisions and subdivisions, might result in fragmentation alien to "whole learning," if the theme of flexibility did not systematically integrate and unify the book.

Lyle Miller, like Sheldon and Braam, keynotes a special concept of reading rate. However, reading "efficiency" is the basic idea of his book. The efficient reader maintains a good *rate of understanding* as he reads.

Thirty reading selections accompanied by rate tables and comprehension tests comprise the bulk of the volume. Selections are of ample length with the first twenty approximating 2000–4000 words and the remaining ten rang-

ing between 8000 and 10,000 words. The student is directed to read a selection for a ten-minute period. One-hundred-word-interval marks at the side of the reading column enable him to score the place which he has reached when time is called. Selections are graded (approximately tenth grade through college graduate).

The reading exercises are introduced by two substantial articles on "Reading as a Basic Skill" and "Attaining Versatility in Reading," and they are supported by a Progress Chart, a Time Budget Sheet, and "Some Hints on Planning a Better Study Schedule."

Miller declares that his book, which primarily is a check on reading skills, is designed to supplement the basic exercises used in most reading centers. This is a modest limitation; the manual could very well be basic itself.

The Cosper-Griffin book, like the Miller volume, is a manual in which difficulty ratings are the basis for comparing the sections. Cosper and Griffin, however, are more traditional than either Miller or Sheldon and Braam. Practice and progress are considered in the common terminology of words per minute and per cents of correct answers on comprehension tests; more than half of the reading selections are from high-interest, periodical-type articles; and most passages are of 1000 to 2000 words in length.

The twenty-six selections of the Cosper-Griffin book are on a variety of topics described as the "usual reading of educated adults."

A particular feature of the Cosper-Griffin book is the inclusion of six "Progress Tests." Conversion tables and a Progress Chart also are part of the testing material.

The fourth book under review, the Grebanier-Reiter work, considers reading improvement along with writing improvement. This is a collection of writings of two kinds. Part One presents model selections along with sparkling analyses by Grebanier and Reiter. Part Two consists of complete essays, some of which are familiar classics and some of which are new to freshman anthologies. This collection is intended "to encourage close reading and individual thought and to provide perspective for discussion and composition."

Instructors with major backgrounds in education and psychology may not recognize the Grebanier-Reiter work as a canon in the field of "reading improvement." On the other hand, English teachers without a formal reading orientation may prefer it to the Sheldon-Braam and the Cosper-Griffin books. Every teacher concerned with developing the reading ability of his students, however, should consider the advisability of using varied kinds of materials.

—Phillip Shaw

Brooklyn College

How to Interview. (Fourth Revised Edition.) By Walter Van Dyke Bingham, Bruce Victor Moore, and John W. Gustad. New York: Harper & Brothers, 1959; pp. viii + 278. $4.50.

In the opinion of this reviewer the authors of *How to Interview* have rendered a real service to persons preparing for careers involving the employment of the interview. Although the book is designed primarily for beginners, many experienced practitioners will welcome this revised version of Bingham's classic volume. The late Dr. Bingham, master of the art of interviewing, in successive editions of his book has established a reputation for

keeping pace with the rapid developments resulting from research and practice. Moore and Gustad have kept faith with the Bingham tradition.

The reader is directed, step by step, through the most difficult stages of the interview, guided past the many pitfalls in acquiring the technique, and shown the numerous applications of this important tool of communication.

The book is divided into five major parts. The first which includes an excellent chapter on the selection and training of the interviewer, is devoted to the basic principles of the interview. The next three sections cover the applications of the interview in selecting and placing employees, conducting public opinion polls, making commercial surveys, improving employment relations, reporting for newspapers, and securing legal evidence. The fourth section deals with the case study, vocational counseling, and the clinical interview. A brief summary chapter completes the book.

It is noteworthy that the authors have avoided the error of championing any particular school of counseling and have given unbiased attention to the worthy contributions from all. Selected references at the end of each chapter have been revised in the light of recent literature. A lucid style, combined with meaty substance, makes *How to Interview* a valuable addition to the literature.

—J. W. MacDonald

Grove City College

Learning to Work in Groups. By Matthew B. Miles. New York: Bureau of Publications, Teachers College, Columbia University, 1959; pp. xvi + 285. $5.00.

In the preface Miles states that the "book is an attempt to bring together what is now known about the practical problems of helping people learn better group behavior, and to apply this knowledge to the special and important case of American public education." The author has been highly successful in achieving both aims. In fact, his book has applications in almost any area where skill in working in groups is essential.

The book includes sections presenting the nature of effective group behavior, a description of the "training process," the requirements in planning for a training program, suggestions for designing training activities, specific training activities, suggestions for taking the trainer role, and methods of evaluation. Cross references, footnotes, chapter previews and summary comments, and appendices add to the usefulness of the book.

This book is highly recommended to all persons who wish to improve their effectiveness in working in groups. It is well grounded in theory and research; yet this does not interfere with its practicality and clarity of style. There are numerous specific, helpful, and understandable suggestions designed to improve the work of both the trainer and the member of the group. The primary aim of these suggestions is functional; they give the reader the confidence needed to try them out. The style of the book is an outstanding example of clear communication; the content will contribute greatly to improved communication and to better human relations in small groups.

—MPA

GUEST EDITORIAL

(Continued from Inside Front Cover page.)

3. The pressure to reach an accommodation among the interacting political, economic, and cultural forces.

4. The imperative need to achieve international understandings by democratic discussion rather than by thermonuclear destruction.

5. The importance of achieving the most intelligent and extensive citizen understanding of problems and participation in the development of solutions at all levels.

6. The real danger that the basic element in social organization, functional communication, may be poorly understood, inadequately developed, deliberately controlled, and even destroyed.

What are the specific and immediate steps that may be taken? A fundamental consideration is concerted and continuing efforts to develop a public climate in which the role of communication can be understood and in which, as a consequence, communication is recognized as a basic discipline instead of as a common tool or a magical name. This happy condition would be speeded if more generous support were available for research, for teaching, and for application studies in the humanities and the social sciences. A resolution adopted by both the NSSC and the SAA at their 1960 conventions called for Federal funds similar to those which the government already is providing to encourage research in foreign languages and in the sciences. Our modest request, in part, calls for

> . . . encouragement and financial support for undergraduate, graduate and special programs of study, research and training in the humanities and social sciences . . . the need to include in such programs study of the nature and role of all forms of communication in a free society, and . . . [for] all appropriate national and regional associations . . . [to] join in the petition and subsequent discussions and activities.

President Kennedy and several key members of Congress received copies of the full statement sympathetically. But neither association has undertaken the continuing, coordinated drive so essential to favorable action. Such massive Federal support is essential if these areas of study (including communication) are to make their appropriate and necessary contributions.